तार : विश्वविद्यालय
Gram : UNIVERSITY

टेलीफोन : कार्या0 : 2320496
कुलसचिव : निवास : 2321214
फैक्स : 0510 : 2321667

बुन्देलखण्ड विश्वविद्यालय, झाँसी
BUNDELKHAND UNIVERSITY, JHANSI

झाँसी (उ.प्र.) 284128

संदर्भ BU/Academic) 2017/ 4282 - 4285

दिनाँक 15/09/2017

The Minutes of Meeting of BOS

In reference to the BOS of department of ELECTRONICS and COMMUNICATION ENGINEERING, Institute of ENGG & TECH. ..... held on 15/09/2017 regarding the revision of syllabus in tune with CBCS/NEP-2020 and subsequent approval from Academic Council. This is to certify that the syllabus is 100% revised.

Registrar
Bundelkhand University
JHANSI

HOD/Coordinator
(ZAKIR ALI)

बुन्देलखण्ड विश्वविद्यालय, झाँसी

सूचना

माननीय कुलपति जी आदेशानुसार सूचित किया जाता है कि B.Tech. Deptt.of Electronics & Communication, Engg. पाठ्यक्रम समिति की बैठक दिनांक 15/12/2020 को पूर्वान्ह 11.00 बजे विश्वविद्यालय सभागार में आहूत की गयी है। अतः आपसे अनुरोध है कि बैठक में निर्धारित तिथि एवं समय पर उपस्थित होने का कष्ट करें।

कार्यसूची :–

1. उत्तर प्रदेश शासन के पत्र संख्या–नि.–05/सत्तर–1–2014 दिनांक 25/02/2014 मे दिये गये शिक्षा में सुधार सम्बन्धी बिन्दुओं पर विचार।
2. सत्र 2020–2021 की परीक्षा हेतु प्राशिनकों/ परीक्षकों की सूची तैयार करने सम्बन्धी कार्य।
3. अन्य मद अध्यक्ष की अनुमति से।

सेवा में,

Internal Members

1- Prof. S.K.Katiyar, Dean -IET, BU JHANSI.
2- Er.Brajendra Shukla Acd. Co ordinator Deptt. of Biotechnology Engg.IET,B.U.Jhansi
3- Dr.Zakir Ali , Coordinator / Convener Deptt. Of Electronics & Comm. Engg. , IET BU Jhansi.
4- Er. Naushad Siddiqui, Member, Deptt. of Electronics & Comm. Engg. , IET BU Jhansi.
5- Er. Rajesh Kumar Verma,Member, Deptt. Of Electronics & Comm. Engg., IET BU Jhansi.

15-12-20
कुलसचिव

बुन्देलखण्ड विश्वविद्यालय, झाँसी

पत्रांकः– बु0वि0/एके0/2020/5528–5532 दिनांकः– 15-12-2020

प्रतिलिपि – निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1. उपरोक्त समस्त सदस्यों को।
2. वित्त अधिकारी।
3. परीक्षा नियंत्रक।
4. सहायक कुलसचिव (अतिगोपनीय)।
5. कुलपति जी के निजी सचिव।
6 कुलसचिव के आशुलिपिक।
7. सम्बन्धित पत्रावली।

कुलसचिव

BOS अधिकारी 29-1-2021

बुन्देलखण्ड विश्वविद्यालय, झाँसी

सूचना

माननीय कुलपति जी आदेशानुसार सूचित किया जाता है कि B.Tech. Deptt.of Electronics & Communication, Engg. पाठ्यक्रम समिति की बैठक दिनांक 15/12/2020 को पूर्वान्ह 11.00 बजे विश्वविद्यालय सभागार में आहूत की गयी है। अतः आपसे अनुरोध है कि बैठक में निर्धारित तिथि एवं समय पर उपस्थित होने का कष्ट करें।

कार्यसूची :–

1. उत्तर प्रदेश शासन के पत्र संख्या–नि.–05/सत्तर–1–2014 दिनांक 25/02/2014 मे दिये गये शिक्षा में सुधार सम्बन्धी बिन्दुओं पर विचार।
2. सत्र 2020–2021 की परीक्षा हेतु प्राशिनकों/ परीक्षकों की सूची तैयार करने सम्बन्धी कार्य।
3. अन्य मद अध्यक्ष की अनुमति से।

सेवा में,

Internal Members

1- Prof. S.K.Katiyar, Dean -IET, BU JHANSI.
2- Er.Brajendra Shukla Acd. Co ordinator Deptt. of Biotechnology Engg.IET,B.U.Jhansi
3- Dr.Zakir Ali , Coordinator / Convener Deptt. Of Electronics & Comm. Engg. , IET BU Jhansi.
4- Er. Naushad Siddiqui, Member, Deptt. of Electronics & Comm. Engg. , IET BU Jhansi.
5- Er. Rajesh Kumar Verma,Member, Deptt. Of Electronics & Comm. Engg., IET BU Jhansi.

5-12-20
कुलसचिव

बुन्देलखण्ड विश्वविद्यालय, झाँसी

पत्रांकः– बु0वि0/एके0/2020/5528–5532 दिनांकः– 15-12-2020

प्रतिलिपि – निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

1. उपरोक्त समस्त सदस्यों को।
2. वित्त अधिकारी।
3. परीक्षा नियंत्रक।
4. सहायक कुलसचिव (अतिगोपनीय)।
5. कुलपति जी के निजी सचिव।
6 कुलसचिव के आशुलिपिक।
7. सम्बन्धित पत्रावली।

कुलसचिव

BOARD OF STUDIES-2020-21

B.TECH. (ELECTRONICS & COMMUNICATION ENGINEERING)

A Committee is constituted with the approval of Hon'ble Vice Chancellor vide office order BU/ACADEMICS/2020/5528-5532 to meet on 15th December 2020 , in the University conference room to discuss the issues concerning the evaluation scheme according to CBCS , internal / external examiners panel of B.Tech. (E.&C. Engg.) for academic session 2020-21

MEMBERS PRESENT:

1. Prof. S K Katiyar, Dean (Engg.), B.U., Jhansi(UP).
2. Er. Brajendra Shukla, Academic Coordinator, IET,BU,Jhansi
3. Dr. Zakir Ali, Coordinator / Convenor , Deptt of E.&C.Engg. IET BU Jhansi.
4. Dr. Naushad Ather Siddiqui, Asstt. Prof. Deptt of E.&C.Engg. IET BU Jhansi.
5. Er. Rajesh Kumar Verma, Asstt. Prof. Deptt of E.&C.Engg. ,IET BU Jhansi.

AGENDA:

1. Internal / External Examiners panel of B.Tech. (E&C). (2^{nd} / 3^{rd} / 4^{th} year) for the academic session 2020-21.
2. Evaluation Scheme according to CBCS for the academic session 2020-21.
3. Updation in CBCS system of academic session 2018-2019 for V,VI,VII AND VIII semesters making grand total 8000 and total credit 160 excluding GP.
4. Updation in CBCS system of academic session 2019-2020 for III,IV,V,VI,VII AND VIII semesters making grand total 8000 and total credit 160 excluding GP.

MINUTES OF THE MEETING:

1. Internal / External Examiners panel for theory / practicals of B.Tech. (E&C). (2^{nd} / 3^{rd} / 4^{th} year) for academic session 2020-21 was put before the members of Board of Studies and was finalized.
2. Evaluation Scheme according to CBCS of B.Tech. (E&C). (2^{nd} / 3^{rd} / 4^{th} year) for the academic session 2020-21 was put before the members of Board of Studies and was finalized.
3. BOS for BATCH 2018-2019 from session 2020-2021 revised from V semester onwards
4. BOS for BATCH 2019-2020 from session 2020-2021 revised from III semester onwards

15/12/2020

Dr. Zakir Ali
Coordinator & Convener

15/12/2020

Dr. N. A. Siddqui
Member

15/12/2020

Er. Rajesh K. Verma
Member

15/12/2020

Er. Brajendra Shukla

Prof. S.K. Katiyar

INSTITUTE OF ENGINEERING & TECHNOLOGY

BUNDELKHAND UNIVERSITY, JHANSI

DEPARTMENT
OF
ELECTRONICS & COMMUNICATION ENGINEERING.

SYLLABUS

2019-2020

(REVISED 2020-2021)

Revised Courses and Evaluation Scheme
(Effective from the session: 2020-2021)FOR BATCH 2019-2020
B.Tech. Electronics & Communication Engineering
Second Year, Semester-III

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Total			
1	2311	Mathematics -III	3	1	0	30	20	50	100	150	4
2	2312	Networks Analysis and Synthesis	3	1	0	30	20	50	100	150	4
3	2313	Electronic Measurements and Instrumentation	3	-	0	30	20	50	100	150	3
4	2321	Semiconductor Material & Devices	3	-	0	30	20	50	100	150	3
5	2322	Digital Electronics	3	-	0	30	20	50	100	150	3
Practicals / Training / Projects											
6	20316	Network Lab	0	0	2	-	-	20	30	50	1
7	20317	Instrumentation & Measurements Lab	0	0	2	-	-	20	30	50	1
8	20318	Electronics Lab I	0	0	2	-	-	25	50	75	1
9	20319	Digital Electronics Lab	0	0	2	-	-	25	50	75	1
10	20320	General Proficiency	-	-	-	-	-	50	-	50	
Grand Total			**15**	**2**	**8**					**1050**	**21**

TA- Teacher's Assessment,

CT-Class Test,

ESE- End Semester Examination

15/12/2020

Dr. Zakir Ali
Coordinator & Convener

Dr. N. A. Siddqui
Member

Er. Rajesh K. Verma
Member

Er. Brajendra Shukla
Academic Coordinator

Prof. S.K. Katiyar
Dean Engineering

Revised Courses and Evaluation Scheme
(Effective from the session: 2020-2021)FOR BATCH 2019-2020
B.Tech. Electronics & Communication Engineering

Second Year, Semester-IV

S. NO.	Theory Papers		Periods			Evaluation Schem				Total	Credi
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Tot			
1	2316	Electromagnetic Field Theory	3	1	0	30	20	50	100	150	4
2	2317	Signals and Systems	3	1	0	30	20	50	100	150	4
3	2324	Electronic Circuits	3	-	0	30	20	50	100	150	3
4	2325	Microprocessor & Applications	3	-	0	30	20	50	100	150	3
5	2326	Programming in C++ & Data Structure	3	-	0	30	20	50	100	150	3
	Practicals / Training / Projects										
6	20321	Electronics Lab II	0	0	2	-	-	25	50	75	1
7	20322	Electronics Workshop & PCB Lab	0	0	2	-	-	25	50	75	1
8	20324	Data Structure Lab	0	0	2	-	-	20	30	50	1
9	20325	Microprocessor Lab	0	0	2	-	-	20	30	50	1
10	20326	General Proficiency	-	-	-	-	-	50	-	50	
		Grand Total	**15**	**2**	**8**					**1050**	**21**

TA- Teacher's Assessment,

CT-Class Test,

ESE- End Semester Examination

15/12/2020

Dr. Zakir Ali
Coordinator & Convener

Dr. N. A. Siddqui
Member

Er. Rajesh K Verma
Member

Er. Brajendra Shukla
Academic Coordinator

Prof. S.K. Katiyar
Dean Engineering

Revised Courses and Evaluation Scheme
(Effective from the session: 2020-2021)FOR BATCH 2019-2020
B.Tech. Electronics & Communication Engineering

Third Year, Semester-V

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Total			
1	3311	Microcontroller & Embedded Systems	3	-	0	30	20	50	100	150	3
2	3312	Analog Integrated Circuits	3	-	0	30	20	50	100	150	3
3	3313	Principles of Communication	3	-	0	30	20	50	100	150	3
4	3314	Antenna & Wave Propagation	3	1	0	30	20	50	100	150	4
5	3315	Automatic Control System	3	1	0	30	20	50	100	150	4
Practicals / Training / Projects											
6	30316	Microcontroller Lab	0	0	2	-	-	25	50	75	1
7	30317	Analog Integrated Circuit Lab	0	0	2	-	-	25	50	75	1
8	30318	Communication Lab I	0	0	2	-	-	20	30	50	1
9	30319	Seminar	0	0	2	-	-	50	-	50	1
10	30320	General Proficiency	-	-	-	-	-	50	-	50	
Grand Total			**15**	**2**	**8**					**1050**	**21**

TA- Teacher's Assessment,

CT-Class Test,

ESE- End Semester Examination

Dr. Zakir Ali
Coordinator & Convener

15/12/2020

Dr. N. A. Siddqui
Member

Er. Rajesh K. Verma
Member

Er. Brajendra Shukla
Academic Coordinator

Prof. S.K. Katiyar
Dean Engineering

Revised Courses and Evaluation Scheme
(Effective from the session: 2020-2021)FOR BATCH 2019-2020
B.Tech. Electronics & Communication Engineering

Third Year, Semester-VI

S. NO.	Theory Papers		Periods			Evaluation Schem				Total	Cred
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Tot			
1	3316	Microwave Engineering	3	-	0	30	20	50	100	150	3
2	3317	Digital Communication	3	-	0	30	20	50	100	150	3
3	3318	VLSI Technology & Design	3	-	0	30	20	50	100	150	3
4	3319	Industrial Electronics	3	1	0	30	20	50	100	150	4
5	3320	Industrial Management	3	1	0	30	20	50	100	150	4
Practicals / Training / Projects											
6	30321	Microwave Lab	0	0	2	-	-	25	50	75	1
7	30322	Communication Lab II	0	0	2	-	-	25	50	75	1
8	30323	Electronics CAD Lab	0	0	2	-	-	20	30	50	1
9	30324	Minor Project	0	0	2	-	-	20	30	50	1
10	30325	General Proficiency	-	-	-	-	-	50	-	50	
		Grand Total	**15**	**2**	**8**					**1050**	**21**

TA- Teacher's Assessment,

CT-Class Test,

ESE- End Semester Examination

15/11/2020

Dr Zakir Ali
Coordinator & Convener

Dr. N. A. Siddqui
Member

Er. Rajesh K. Verma
Member

Er. Brajendra Shukla
Academic Coordinator

Prof. S.K. Katiyar
Dean Engineering

Revised Courses and Evaluation Scheme
(Effective from the session: 2020-2021)FOR BATCH 2019-2020
B.Tech. Electronics & Communication Engineering

Fourth Year, Semester-VII

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Total			
1	4311	Open Elective	3	1	0	30	20	50	100	150	4
2	4312	Digital Signal Processing	3	-	0	30	20	50	100	150	3
3	4313	Optical Fiber Communication	3	-	0	30	20	50	100	150	3
4	4314	Elective I	3	-	0	30	20	50	100	150	3
5	4315	Elective II	3	-	0	30	20	50	100	150	3
	Practicals / Training / Projects										
6	40316	Digital Signal Processing Lab	0	0	2	-	-	25	50	75	1
7	40317	Communication Lab III	0	0	2	-	-	25	50	75	1
8	40318	Industrial Interaction	0	0	2	-	-	50	-	50	1
10	40320	General Proficiency	-	-	-	-	-	50	-	50	
Grand Total			**15**	**1**	**6**					**1050**	**19**

Note : 4 to 6 week Industrial Training after VI semester to be evaluated in VII semester.

TA- Teacher's Assessment,

CT-Class Test,

ESE- End Semester Examination

Dr. Zakir Ali
Coordinator & Convener
15/12/2020

Dr. N. A. Siddqui
Member

Er. Rajesh K. Verma
Member

Er. Brajendra Shukla
Academic Coordinator

Prof. S.K. Katiyar
Dean Engineering

Revised Courses and Evaluation Scheme
(Effective from the session: 2020-2021)FOR BATCH 2019-2020
B.Tech. Electronics & Communication Engineering

Fourth Year, Semester-VIII

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Tota			
1	4316	Wireless Communication	3	-	0	30	20	50	100	150	3
2	4317	Data Communication Network	3	-	0	30	20	50	100	150	3
3	4318	Elective III	3	-	0	30	20	50	100	150	3
4	4319	Elective IV	3	-	0	30	20	50	100	150	3
	Practicals / Training / Projects										
5	40321	Major Project*	0	0	14	-	-	200	200	400	7
6	40322	General Proficiency	-	-	-	-	-	50	-	50	
Total		**Grand**	**12**	**0**	**14**					**1050**	**19**

*** Out of 14 periods, 2 periods per week should be allotted for interaction of group with project guide and 12 periods per week should be allotted for self studies and project work.**

TA- Teacher's Assessment,

CT-Class Test,

ESE- End Semester Examination

Dr. Zakir Ali
Coordinator & Convener
15/12/2020

Dr. N. A. Siddqui
Member

Er. Rajesh K. Verma
Member

Er. Brajendra Shukla
Academic Coordinator

Prof. S.K. Katiyar
Dean Engineering

DEPARTMENTAL ELECTIVES

ELECTIVE – I

1. EC 011- Digital System Design Using VHDL
2. EC 012 -Fundamentals of Radar & Navigation
3. **EC 013- Artificial Neural Networks**
4. EC 014 -Speech Processing

ELECTIVE – II

1. EC 021- Principles of Secure Communication
2. EC 022 -Spread Spectrum Systems
3. EC 023- Filter Design
4. **EC 024- Satellite Communication**

ELECTIVE – III

1. EC 031 -Digital Image Processing.
2. EC 032- Adaptive Signal Processing
3. EC 033 – Micro & Smart Systems
4. **EC 034- Biomedical Signal Processing**

ELECTIVE – IV

1. **EC 041- Random Signal Theory**
2. EC 042 – Real Time Systems
3. EC 043 -Optical Networks
4. EC 044- Advanced Digital Design using Verilog

15/12/2020

Dr. Zakir Ali
Coordinator & Convener

Dr. N. A. Siddqui
Member

Er. Rajesh K. Verma
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Er. Brajendra Shukla
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Prof. S.K. Katiyar
Dean Engineering

OPEN ELECTIVES

S.NO.	PAPER CODE	PAPER NAME	Department
1.	OE 01	Non-conventional Energy Resources	Electrical
2.	OE 02	Reliability Engineering	Electrical
3.	OE 03	Environment & Ecology	Civil
4.	OE 04	Geographic Inf. System (GIS) Technology & its Applications	Civil
5.	**OE 05**	**Entrepreneurship Development Program**	**Humanities**
6.	OE 06	Ancient Indian Culture	Humanities
7.	OE 07	Human Values	Humanities
8.	OE 08	Quality System & Management	Mechanical
9.	OE 09	Condition Monitoring & Diagnostics	Mechanical
10.	OE 10	Value Engineering	Mechanical
11.	OE 11	Nanotechnology	Mechanical
12.	OE 12	Solar Energy	Mechanical
13.	OE 13	Human Resource Management	Mechanical
14.	OE 14	Advance Material Science	Mechanical
15.	OE 15	Industrial Instrumentation	Instrumentation & Control
16.	OE 16	Biomedical Engineering	Instrumentation & Control
17.	OE 17	Fundamentals of Coding Theory	Electronics & Communication
18.	OE 18	Consumer Electronics	Electronics & Communication
19.	OE 19	Artificial Neural Networks & Fuzzy Logic	Electronics & Communication
20.	OE 20	Human Computer Interaction	Computer Science
21.	OE 21	I T in Business	Information Technology
22.	OE 22	Artificial Intelligence in Manufacturing	Manufacturing Technology
23.	OE 23	Health, Hospital and Equipment Management	Biomedical Engineering
24.	OE 24	Introduction to Medical Physics	Biomedical Engineering
25.	OE 25	Modern Control System	Electrical
26.	OE 26	Mechatronics	Electrical
27.	OE 27	SCADA & Energy Management System	Electrical

Note: The students will choose any one subject of the course of other than their Engineering branch.

15/12/2020

Dr. Zakir Ali
Coordinator & Convener

Dr. N. A. Siddqui
Member

Er. Rajesh K. Verma.
Member

Er. Brajendra Shukla
Academic Coordinator

Prof. S.K. Katiyar
Dean Engineering

INSTITUTE OF ENGINEERING & TECHNOLOGY

BUNDELKHAND UNIVERSITY, JHANSI

DEPARTMENT
OF
ELECTRONICS & COMMUNICATION ENGINEERING.

SYLLABUS

2018-2019

(REVISED -2020-2021)

Revised Courses and Evaluation Scheme
(Effective from the session: 2018-2019) FOR BATCH 2018-2019
B.Tech. Electronics & Communication Engineering

Second Year, Semester-III

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Total			
1	2311	Mathematics -III	3	1	0	30	20	50	100	150	4
2	2312	Networks Analysis and Synthesis	3	1	0	30	20	50	100	150	4
3	2313	Electronic Measurements and Instrumentation	3	-	0	30	20	50	100	150	3
4	2321	Semiconductor Material & Devices	3	-	0	30	20	50	100	150	3
5	2322	Digital Electronics	3	-	0	30	20	50	100	150	3
Practicals / Training / Projects											
6	20316	Network Lab	0	0	2	-	-	20	30	50	1
7	20317	Instrumentation & Measurements Lab	0	0	2	-	-	20	30	50	1
8	20318	Electronics Lab I	0	0	2	-	-	20	30	50	1
9	20319	Digital Electronics Lab	0	0	2	-	-	20	30	50	1
10	20320	General Proficiency	-	-	-	-	-	50	-	50	
Grand Total			**15**	**2**	**8**					**1000**	**21**

TA- Teacher's Assessment,

CT-Class Test,

ESE- End Semester Examination

15/12/2020

Dr. Zakir Ali
Coordinator & Convener

Dr. N. A. Siddqui
Member

Er. Rajesh K. Verma
Member

15/12/2020

Er. Brajendra Shukla
Academic Coordinator

Prof. S.K. Katiyar
Dean Engineering

Revised Courses and Evaluation Scheme
(Effective from the session: 2018-2019) FOR BATCH 2018-2019
B.Tech. Electronics & Communication Engineering

Second Year, Semester-IV

S. NO.	Theory Papers		Periods			Evaluation Schem				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Tot			
1	2316	Electromagnetic Field Theory	3	1	0	30	20	50	100	150	4
2	2317	Signals and Systems	3	1	0	30	20	50	100	150	4
3	2324	Electronic Circuits	3	1	0	30	20	50	100	150	4
4	2325	Microprocessor & Applications	3	1	0	30	20	50	100	150	4
5	2326	Programming in C++ & Data Structure	3	1	0	30	20	50	100	150	4
Practicals / Training / Projects											
6	20321	Electronics Lab II	0	0	2	-	-	20	30	50	1
7	20322	Electronics Workshop & PCB Lab	0	0	2	-	-	20	30	50	1
8	20324	Data Structure Lab	0	0	2	-	-	20	30	50	1
9	20325	Microprocessor Lab	0	0	2	-	-	20	30	50	1
10	20326	General Proficiency	-	-	-	-	-	50	-	50	
		Grand Total	15	5	8					1000	24

TA- Teacher's Assessment,

CT-Class Test,

ESE- End Semester Examination

15/12/2020

Dr. Zakir Ali
Coordinator & Convener

Dr. N. A. Siddqui
Member

Er. Rajesh K. Verma
Member

Er. Brajendra Shukla
Academic Coordinator

Prof. S.K. Katiyar
Dean Engineering

Revised Courses and Evaluation Scheme
(Effective from the session: 2020-2021) FOR BATCH 2018-2019
B.Tech. Electronics & Communication Engineering

Third Year, Semester-V

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Total			
1	3311	Microcontroller & Embedded Systems	3	-	0	30	20	50	100	150	3
2	3312	Analog Integrated Circuits	3	-	0	30	20	50	100	150	3
3	3313	Principles of Communication	3	-	0	30	20	50	100	150	3
4	3314	Antenna & Wave Propagation	3	-	0	30	20	50	100	150	3
5	3315	Automatic Control System	3	1	0	30	20	50	100	150	4
Practicals / Training / Projects											
6	30316	Microcontroller Lab	0	0	2	-	-	25	50	75	1
7	30317	Analog Integrated Circuit Lab	0	0	2	-	-	25	50	75	1
8	30318	Communication Lab I	0	0	2	-	-	25	50	75	1
9	30319	Seminar	0	0	2	-	-	75	-	75	1
10	30320	General Proficiency	-	-	-	-	-	50	-	50	
Grand Total			**15**	**1**	**8**					**1100**	**20**

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CT-Class Test,

ESE- End Semester Examination

15/12/2020

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Revised Courses and Evaluation Scheme
(Effective from the session: 2020-2021) FOR BATCH 2018-2019
B.Tech. Electronics & Communication Engineering

Third Year, Semester-VI

S. NO.	Theory Papers		Periods			Evaluation Schem				Total	Cred
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Tot			
1	3316	Microwave Engineering	3	-	0	30	20	50	100	150	3
2	3317	Digital Communication	3	-	0	30	20	50	100	150	3
3	3318	VLSI Technology & Design	3	-	0	30	20	50	100	150	3
4	3319	Industrial Electronics	3	-	0	30	20	50	100	150	3
5	3320	Industrial Management	3	1	0	30	20	50	100	150	4
Practicals / Training / Projects											
6	30321	Microwave Lab	0	0	2	-	-	25	50	75	1
7	30322	Communication Lab II	0	0	2	-	-	25	50	75	1
8	30323	Electronics CAD Lab	0	0	2	-	-	25	50	75	1
9	30324	Minor Project	0	0	2	-	-	25	50	75	1
10	30325	General Proficiency	-	-	-	-	-	50	-	50	
		Grand Total	**15**	**1**	**8**					**1100**	**20**

TA- Teacher's Assessment,

CT-Class Test,

ESE- End Semester Examination

15/12/2020

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Revised Courses and Evaluation Scheme
(Effective from the session: 2020-2021) FOR BATCH 2018-2019
B.Tech. Electronics & Communication Engineering

Fourth Year, Semester-VII

S. No.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Total			
1	4311	Open Elective	3	1	0	30	20	50	100	150	4
2	4312	Digital Signal Processing	3	-	0	30	20	50	100	150	3
3	4313	Optical Fiber Communication	3	-	0	30	20	50	100	150	3
4	4314	Elective I	3	-	0	30	20	50	100	150	3
5	4315	Elective II	3	-	0	30	20	50	100	150	3
	Practicals / Training / Projects										
6	40316	Digital Signal Processing Lab	0	0	2	-	-	25	50	75	1
7	40317	Communication Lab III	0	0	2	-	-	25	50	75	1
8	40318	Industrial Interaction	0	0	2	-	-	50	-	50	1
10	40320	General Proficiency	-	-	-	-	-	50	-	50	
Grand Total			**15**	**1**	**6**					**1050**	**19**

Note : 4 to 6 week Industrial Training after VI semester to be evaluated in VII semester.

15/12/2020

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Revised Courses and Evaluation Scheme
(Effective from the session: 2020-2021) FOR BATCH 2018-2019
B.Tech. Electronics & Communication Engineering

Fourth Year, Semester-VIII

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Tota			
1	4316	Wireless Communication	3	-	0	30	20	50	100	150	3
2	4317	Data Communication Network	3	-	0	30	20	50	100	150	3
3	4318	Elective III	3	-	0	30	20	50	100	150	3
4	4319	Elective IV	3	-	0	30	20	50	100	150	3
	Practicals / Training / Projects										
5	40321	Major Project*	0	0	14	-	-	200	200	400	6
7	40322	General Proficiency	-	-	-	-	-	50	-	50	
Total		**Grand**	**12**	**0**	**14**					**1050**	**18**

*** Out of 14 periods, 2 periods per week should be allotted for interaction of group with project guide and 12 periods per week should be allotted for self studies and project work.**

15/12/2020

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DEPARTMENTAL ELECTIVES

ELECTIVE – I

1. EC 011- Digital System Design Using VHDL
2. EC 012 -Fundamentals of Radar & Navigation
3. **EC 013- Artificial Neural Networks**
4. EC 014 -Speech Processing

ELECTIVE – II

1. EC 021- Principles of Secure Communication
2. EC 022 -Spread Spectrum Systems
3. EC 023- Filter Design
4. **EC 024- Satellite Communication**

ELECTIVE – III

1. EC 031 -Digital Image Processing.
2. EC 032- Adaptive Signal Processing
3. EC 033 – Micro & Smart Systems
4. **EC 034- Biomedical Signal Processing**

ELECTIVE – IV

1. **EC 041- Random Signal Theory**
2. EC 042 – Real Time Systems
3. EC 043 -Optical Networks
4. EC 044- Advanced Digital Design using Verilog

15/12/2020

OPEN ELECTIVES

S.NO.	PAPER CODE	PAPER NAME	Department
1.	OE 01	Non-conventional Energy Resources	Electrical
2.	OE 02	Reliability Engineering	Electrical
3.	OE 03	Environment & Ecology	Civil
4.	OE 04	Geographic Inf. System (GIS) Technology & its Applications	Civil
5.	**OE 05**	**Entrepreneurship Development Program**	**Humanities**
6.	OE 06	Ancient Indian Culture	Humanities
7.	OE 07	Human Values	Humanities
8.	OE 08	Quality System & Management	Mechanical
9.	OE 09	Condition Monitoring & Diagnostics	Mechanical
10.	OE 10	Value Engineering	Mechanical
11.	OE 11	Nanotechnology	Mechanical
12.	OE 12	Solar Energy	Mechanical
13.	OE 13	Human Resource Management	Mechanical
14.	OE 14	Advance Material Science	Mechanical
15.	OE 15	Industrial Instrumentation	Instrumentation & Control
16.	OE 16	Biomedical Engineering	Instrumentation & Control
17.	OE 17	Fundamentals of Coding Theory	Electronics & Communication
18.	OE 18	Consumer Electronics	Electronics & Communication
19.	OE 19	Artificial Neural Networks & Fuzzy Logic	Electronics & Communication
20.	OE 20	Human Computer Interaction	Computer Science
21.	OE 21	I T in Business	Information Technology
22.	OE 22	Artificial Intelligence in Manufacturing	Manufacturing Technology
23.	OE 23	Health, Hospital and Equipment Management	Biomedical Engineering
24.	OE 24	Introduction to Medical Physics	Biomedical Engineering
25.	OE 25	Modern Control System	Electrical
26.	OE 26	Mechatronics	Electrical
27.	OE 27	SCADA & Energy Management System	Electrical

Note : The students will choose any one subject of the course of other than their Engineering branch.

15/12/2026

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Dean Engineering

INSTITUTE OF ENGINEERING & TECHNOLOGY

BUNDELKHAND UNIVERSITY, JHANSI

DEPARTMENT
OF
ELECTRONICS & COMMUNICATION ENGINEERING.

SYLLABUS

2020-2021

L	T	P
3	1	0

MATHEMATICS –III
(2311)

Unit – I

Function of Complex variable

Analytic function, C-R equations, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic function, Taylor's and Laurent's series, singularities, Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$

Unit – II

Statistical Techniques - I

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non – linear and multiple regression analysis, Probability theory.

Unit – III

Statistical Techniques - II

Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations: Chi-square test, t-test, Analysis of variance (one way) , Application to engineering, medicine, agriculture etc.

Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, $\bar{x}$, R, p, np, and c charts.

Unit – IV

Numerical Techniques – I

Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods.

Interpolation: Finite differences, difference tables, Newton's forward and backward interpolation , Lagrange's and Newton's divided difference formula for unequal intervals.

Unit – V

Numerical Techniques –II

Solution of system of linear equations, Gauss- Seidal method, Crout method. Numerical differentiation, Numerical integration , Trapezoidal , Simpson's one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous) equations by Euler's, Picard's and forth-order Runge- Kutta mehods.

Books Recommended

1. Jain, Iyenger & Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi , 2003.
2. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd.,2000
3. R.K. Jain & S.R.K. Iyenger,Advance Engg Mathematics,Narosa Pub House, 2002.
4. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
5. E. Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
7. S.P.Gupta, Statistical Methods, Sultan and Sons, New Delhi, 2004.
8. Devore, Probability and Statistics, Thomson(Cengage) Learning, 2007.
9. Walpole, Myers, Myers & Ye, Probability and Statistics for Engineers & Scientists, Pearson Education, 2003.

NETWORK ANALYSIS AND SYNTHESIS
(2312)

Unit – I :

Graph Theory : Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.

Unit – II :

Network Theorems (Applications to ac networks): Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.

Unit – III :

Network Functions :

Concept of Complex frequency , Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot, frequency response and Bode plots.

Transient Analysis Of Networks

Network elements, Transient response of R-L, R-C, R-L-C for DC and sinusoidal excitation, Initial condition, Solution using differential equation approach and Laplace transform method.

Unit – IV :

Two Port Networks:

Characterization of LTI two port networks Z,Y, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & Π Representation.

Unit – V :

Network Synthesis :

Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Caucer first and second forms.

Text Books:

1. M.E. Van Valkenburg," Network Analysis", Prentice Hall of India
2. D.Roy Choudhary,"Networks and Systems" Wiley Eastern Ltd.
3. Donald E. Scott : "An Introduction to Circuit analysis: A System Approach" McGraw Hill Book Company.
4. A.Chakrabarti,"Circuit Theory" Dhanpat Rai & Co.

Reference Books :

5. M.E. Van Valkenburg,"An Introduction to Modern Network Synthesis",Wiley Eastern Ltd.
6. W.H. Hayt & Jack E-Kemmerly, Engineering Circuit analysis" Tata McGraw Hill.
7. Soni, Gupta ,"Circuit Analysis", Dhanpat Rai & Sons.
8. Ram Kalyan, Linear Circuits Oxford University Press.

ELECTRONICS MEASUREMENTS AND INSTRUMENTATION
(2313)

Unit-I : Theory of Measurement
Introduction, Types of error, Error analysis: uncertainity , precision, accuracy. statistical analysis, Gaussian error distribution.

Unit-II : Transducers
Passive transducers : Resistive, Inductive and capacitive
Active transducers : Thermoelectric, piezoelectric & photoelectric

Unit-III : Analog Meters
AC analog meters: Principle of operation, Average, Peak and RMS responding voltmeters, sampling voltmeters.
Electronics Analog meters: Electronics analog DC and AC voltmeter and ammeters, Electronic analog ohmmeter and multimeter.

Unit-IV :Digital Meters
Digital voltmeter, digital multimeter, Display devices : indicating system, numeric & alpha number display using LCD & LED, specification of digital meters: display digit & counts resolution, sensitivity , accuracy, speed & settling time etc.

Unit-V : Oscilloscopes & Bridges
Types of oscilloscopes, controls, Measurements of voltage, frequency , time & Phase. High frequency measurements. Horizontal and Vertical deflection system of CRT.
Bridges : Direct current and alternating current bridges, LCR bridges

Unit-VI: Function Generators & Analyzers
Function Generators: Sine-wave, non- sinusoidal, frequency synthesis techniques & digital signal generators.
Signal Analyzers : Distortion, wave and spectrum analyzers, network analyzer.

Text Books :

1. Electronic Instruments & Instrumentation Technology by MMS Anand, PHI Pvt. Ltd., New Delhi Ed. 2005
2. Electronics Instrumentation by H.S. Kalsi TMH Ed. 2004

Reference Books :

1. Electronics Instrumentation & Measurement Techniques by W.D. cooper & A.D. Helfrick, PHI 3rd Ed.
2. Electronic Measurement & Instrumentation by Oliver & Cage Mc-Graw Hill.

SEMICONDUCTOR MATERIALS AND DEVICES
(2321)

Unit-I : Crystal Properties and charge Carriers in Semiconductors

Elemental and compound semiconductor materials, crystal lattice structure. Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.

Unit-II : Excess Cariers in Semiconductors

Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.

Unit-III : Junction Properties

Equilibrium conditions, biased junctions, steady state conditions, break down mechanism (rectifying diodes, Zener diodes). Transient conditions, metal semiconductor junctions, hetero junctions, (Varactor Diode, switching diodes and Schottky diodes.)

Unit-IV : Transitors and Optoelectronic Devices

Metal semiconductor field effect transistors (MESFET), metal insulator semiconductor field effect transistors (MISFET), Construction, Operation and characteristics of above devices. Photodiodes, photo detectors, solar cell, light emitting diodes, light emitting materials, optical fibre, semiconductor lasers, material for semiconductor lasers.

Unit-V : Power Devices

Four layer devices : P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices : DIAC, TRIAC, IGBT.

Text Book

1. Ben G. Streetman, "Solid state electronic devices", Pearson Eduction, 2003, Fifth edition .

Reference Books :

1. J. Millman and Halkiyas, "Integrated Electronics", TMH, 2002.
2. S.M. Sze, "Physics of Semiconductor devices", John Wiley.
3. Adir Bar-Lev, "Semiconductor and electronic devices", PHI.
4. D.A. Neaman, "Semiconductor physic and devices – basic principles", Home wood IL, 1992.

DIGITAL ELECTRONICS

(2322)

Unit-I : Number System & Codes

Number systems and their inter conversion, Binary Arithmetic (Addition, Subtraction, Multiplication And Division), Diminished radix and radix compliments, BCD codes, excess 3 codes, grey codes, Hamming Codes, error detection and correction.

Boolean Algebra & Logic Gates : Digital logic gates, Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean Functions, Canonical and standard form map method,two variable, three variable, four variable, five variable maps, Sum of products and Product of sums simplification, NAND and NOR implementation.

Unit-II : Combinational Logic Circuits

Binary Adders and subtractors , Binary Multiplier, Magnitude Comparator,Multiplexers / Demultiplexers, encoder / decoders, decimal adders , ROM as decoder,

Unit-III : Sequential Logic Circuits

Introduction, SR Flip –Flops , JK flip flops, D flip flops, T flip flop, master slave flip flop, excitation table , Inter-conversions of flip flops, Classification of sequential circuits, Design of shift registers, synchronous counters , Asynchronous Counters, Ring counter, Johnson counter and their applications. A to D and D to A converter.

Unit-IV : Logic Families

Diode, BJT & MOS as a switching element concept of transfer characteristics, Input characteristics and output characteristics of logic gates, Fan-in, Fan-out, Noise margin, circuit concept and comparison of various logic families: RTL, DTL, TTL, IIL, ECL,NMOS, CMOS Tri-state logic, open collector output, Totem pole, Interfacing between logic families, packing density, power consumption & gate delay.

Unit-V : Memories

Sequential, Random Access, NMOS & CMOS Static and Dynamic Memory elements, one and multi-dimensional selection arrangement, Read-only memories, Formation of memory banks. PLA, PAL.

Unit-VI: ASM charts: Representation of sequential circuits using ASM charts, synthesis of output and next state functions, Data path ,control path partition-based design.

Text Books :

1. Digital Design by M Moris Mano, 2nd Edn.PHI
2. Introduction to Digital Microelectronic Circuits, by Gopalan, TMH

Reference Books :

1. Switching Circuit & Logic Design by Hill & Peterson, Wiley
2. Digital Circuit & Logic Design, by Holsworth.

ELECTROMAGNETIC FIELD THEORY
(2316)

Unit 1. Introduction

Review of vector analysis, Scalar & vector products, gradient, divergent and curl of a vector and their physical explanation-Transformation amongst rectangular, cylindrical and spherical co-ordinate system.

Unit 2. Electrostatics

Coulomb's law, electric field intensity from point charges, field due to continuous distribution of charges, gauss's law, Electric displacement and displacement density potential function, potential field of a point charge, laplace's and poison's equations.

Unit 3. Magnetostatics

Magnetic field intensity and magneto motive force, Ampere's Circuital law, Energy stored, Biot-savart law, vector potential, magnetic dipole.

Unit 4. Time Dependent Fields

Ampere's work law in differential vector form, continuity of currents, conduction and displacement current. Maxwell's equations and their interpretations, boundary conditions.Wave equations, sinusoidal time varying fields, uniform plane wave in dielectric and conductor media, skin effect and depth of penetration, reflection and refraction of plane waves at boundaries for normal .

Unit 5. Energy Flow and Poynting Vector

Poynting theorem, interpretation of $E \times H$, Simple application, complex pointing vector.

Unit 6. Transmission Lines

Transmission line theory from the circuit concept, properties; constants, transmission line equations; infinite line; reflections in transmission lines; voltage, current and impedance relations-open and short circuit lines. Standing wave ratio; impedance matching, quarter and half wave lines single stub and double stub matching;

Text Books:

1. Electromagnetic waves & radio system by Jorden R.F..
2. Principle and applications of Electromagnetic fields by Ptonsey R and Collin R.P

References:

1. Applied Electromagnetic by Planus M.A.
2. Electromagnetic Field theory by William Hayt
3. Electromagnetics, JD Kraus, McGraw-Hill
4. Electromagnetic Field Theory Fundamentals by Bhag Singh Guru and Hüseyin R. Hiziroglu, Cambridge University Press

SIGNAL S AND SYSTEMS
(2317)

Unit-I : Signals and Systems

Continuous-time and discrete-time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, Continuous-Time and Discrete-Time LTI Systems and their properties, convolution sum and convolution integrals, LTI System described by differential and difference equation.

Unit-II : Fourier Series and Fourier Transform

The response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-time Periodic Signals and their Properties, Continuous time and discrete time Fourier Transforms and their properties, System Characterized by Linear Constant Coefficient Differential equations and Difference equation.

Unit-III : Time and Frequency Characterization of Signals and Systems

Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency response of LTI systems, Time domain Properties of Ideal Frequency Selective filter, Time Domain and Frequency Domain aspects of Non ideal filters, First Order and Second Order Continuous Time and Discrete time Systems.

Unit-IV : Sampling and Laplace Transform

Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals. Laplace Transform, Region of convergence, inverse Laplace Transform, Analysis and characterization of LTI System, Block diagram representation, Unilateral Laplace transform.

Unit-V : Z-Transform

Z-Transform, Region of convergence, Inverse Z-transform, analysis and characterization of LTI system, Block diagram representation, Unilateral Z-transform.

Text Book

1. V. Oppenheim, A.S. Willsky and S. Hamid Nawab, 'signals & System', PEARSON Education, Second Edition, 2003.

Reference Book

1. Roberts, "Signals and Systems" TATA McGraw Hills.
2. P. Ramesh Babu, R. Ananda Natarajan, ."Signals and Systems", SCITECH Publications.
3. Charles L. Phillips, John M.PARR and EVEA. RISKIN, "Signals, Systems and Transforms", PEARSON Education, Third Edition.
4. Chen 'Signals & Systems, Oxford University, Press.

ELECTRONIC CIRCUITS
(2324)

Unit-I : Bipolar Junction Transistors:

Introduction to Transistor, Transistor as an amplifier, small signal Equivalent circuits and analysis of transistor parameters using h & re model for CB,CC,CE transistor, Internal capacitances of BJT. Introduction to FET & MOSFET.

DC analysis of MOSFET :

MOSFET circuits at DC, MOSFET as an amplifier, biasing in MOS amplifier circuits, Basic configurations of single stage MOS amplifier, Internal capacitances of MOSFETS.

Unit-II: Frequency Response

S-Domain analysis, amplifier transfer function, Low and high frequency response of BJT amplifier

Unit-III: Large Signal Amplifier

Analysis & design of class A, B, AB, C amplifiers, push pull amplifiers, transformer less output stage, distortion calculation.

Unit – IV: Multistage Amplifier

General Cascade system, RC coupled Amplifier and its frequency response, merits and demerits , cascade amplifier, darlington amplifier, multistage frequency effect.

Unit-V: Feed Back

General feed back structure, properties of negative feed back, four basic feed back topologies series shunt; series-series; shunt-shunt; & shunt-series feedback amplifier, determination of Loop gain,

Oscillators : Basic principles of sinusoidal oscillator, RC oscillators: Weinbridge and phases shift, Tuned oscillators: Collpitts, Hartley and Clap. Crystal Oscillators.

Text book:

1. R.Boylestad/ "Electronic Devices & Circuits"/
2. Millman & Halkias "Integrated devices and circuits"/Tata McGraw Hill.
3. A.S. Sedra and K.C. Smith, "Microelectronic circuits", Oxford University Press (India).
4. B.P. Singh & R. Singh, Electronics Devices & Integrated Circuits, Pearson.

Reference Book

1. Millman, J. and Grabel, A./"Microelectronics"/McGraw Hill.
2. Bell, David A/ "Electronic Devices & Circuits"/Prentice Hall (India)4thEdition.
3. Nair, B. Somanathan /"Electronics Devices & Applications"/Prentice-Hall (India)
4. Neamen, Donald A./ "Electronic Circuit Analysis & Design"/Tata McGraw Hill.
5. Neamen, Donald A./"Semiconductor Physics & Devices"/Tata McGraw Hill.
6. Sedra, "Micro Electronics Circuits" Oxford University Press.

Microprocessors and Applications
(2325)

UNIT-I:

Evolution of Microprocessor, Microprocessor architecture and its operations, memory, inputs-outputs (I/Os), data transfer schemes interfacing devices, interrupts. Architectural advancements of microprocessors,.

UNIT-II:

8-bit Microprocessors: 8085 microprocessor: pin configuration, internal architecture. Timing & Signals: control and status, interrupt: ALU, machine cycles,

Instruction Set of 8085: Addressing Modes: Register addressing, direct addressing; register indirect addressing, immediate addressing, and implicit addressing. Instruction formats

Instruction Classification: Data transfer, arithmetic operations, logical operations, branching operation, machine control; Writing assembly Language programs, Assembler directives.

UNIT-III:

16-bit Microprocessors: Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation, Operating Modes Instruction Set of 8086 Addressing Modes: Instruction format.

Discussion on instruction Set: Groups: data transfer, arithmetic, logic string, branch control transfer, processor control. Interrupts: Hardware and software interrupts, responses and types.

Introduction to 80186 and 80286.

UNIT-IV

Programming: Assembly language programming based on Intel 8085 & 8086.

UNIT-V

Peripheral Interfacing: 8237 DMA controller, 8255- Programmable peripheral interface, 8253/8254 Programmable timer/counter. 8259 programmable Interrupt Controller.,8251 USART and RS232C.

Reference Books

1. D. V. Hall : Microprocessors Interfacing, TMH (2nd Edition).

2. R. S. Gaonkar: Microprocessor Architecture, Programming and Applications with 8085/8080,Penram Publication

3. Y.C. Liu and G.A. Gibson : Microcomputer Systems: The 8086/8088 Family Architecture Programming and Design, PHI 2nd Edition.

4. B. Ram, "Advanced Microprocessor & Interfacing" Tata McGraw Hill

5. Renu Singh & B.P.Singh, "Microprocessor and Interfacing and applications" New Age International

6. Hall D.V., "Microprocessors Interfacing" Tata Mc Graw Hill.

7. Liu and Gibson G.A., "Microcomputer Systems: The 8086/8088 Family" Prentice Hall (India)

PROGRAMMING IN C++ & DATA STRUCTURES
(2326)

Programming Fundamentals:

Unit 1 :

Basic stricture of a C++ program, Types and Declarations: Types - Boolean, character, integer, Floating point, enumerated. Conditional statements and loops. Declarations- structure, multiple names, scope, initialization. Function declaration, argument passing, value return. Recursive functions. Macros.

Unit 2 :

Classes - objects, private, public and protected variables. Arrays (one and two dimensional). Pointers, new operator and delete operator for dynamic memory management. Pointer to arrays, constants, reference, pointer to void, pointer to function. Function overloading, operator overloading, friend function, derived class (inheritance), polymorphism, virtual function, templates, Files and streams. Library functions for File and String operations. Introduction to Standard Template Library. Programming tools- make files, debuggers, revision control systems, exception handling.

Data Structure :

Unit 3 :

Stacks : Basic operation of stacks, array representation of stacks, application of stacks. Conversion of infix to prefix and postfix expressions, evaluation of postfix expression using stacks.

Queues : Array and Linked representation and implementation of queues, basic operations on queues.

Unit 4 :

Linked List : Representation and implementation of single and double linked lists, basic operations, traversing and searching of linked list.

Trees : Binary tree, basic operation, binary search tree, binary tree traversal (inorder, preorder, postorder).

Unit 5 :

Searching : Sequential search, binary search, comparison and analysis.

Sorting : Insertion sort, selection sort, bubble sort, quick sort, shell sort, merge sort, heap sort. Comparison of Sorting Algorithms by Speed and Space.

Text Book:

1. B Stroustrup, *The C++ Programming Language*, **3/e**, Edition, Addison Wiley.
2. AV Aho and JD Ullman, *Data Structures and Algorithms*, Pearson Education, 2005.
3. D Samenta, *Classic Data Structures*, PHI, 2005.

Reference:

1. E Balaguruswamy, *Object Oriented Programming with C++*,**3/e**, TMH.
2. Richard F Gilbert, Behrouz A Forouz, *Data Structures A pseudocode Approach with C++*, Thomson, 2001.
3. Langsam, *Data Structures Using C and C++*, **2/e**, Pearson Education.
4. Brain W Kernighan, *The Practice of Programming*, Pearson Education, 2007.
5. Bruce Eckel, *Thinking in C++*, volumeI and volumeII, Pearson Education, 2001.

NETWORK LAB (20316)

Note : Minimum eight experiments are to be performed from the following list.

1. Verification of principle of superposition with dc and ac sources
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3. Verification of Tellegin's theorem for two networks of the same topology
4. Determination of transient response of current in RL and RC circuits with step voltage input
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values
9. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests

Write Demo for the following (in Ms-Power point)

10. Verification of parameter properties in inter-connected two port networks : series,parallel and cascade also study loading effect in cascade
11. Determination of frequency response of a Twin – T notch filter

College may add any three experiments in the above list.

INSTRUMENTATION & MEASUREMENT LAB (20317)

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter .
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer

(i) PT-100 transducer
(ii) J- type transducer
(iii) K-type transducer
(iv) Presser transducer

6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance Kelvin's double bridge.
8. Radio Receiver Measurements
9. RF Low and High Power Measurements

*** College may add two more experiments in the above list.**

ELECTRONICS LAB I (20318)

1. Study of CRO and multimeter applications.
2. Plot V-I characteristics of Junction diode under forward and reverse-biased condition. (Si & Ge)
3. Draw the waveshape of the electrical signal at the input and output points of the half-wave, full wave and bridge rectifiers.
4. Plot the V-I characteristics of zener diode.
5. Realize a voltage regulator using zener diode and study the load characteristics.
6. Plot the I/P output characteristics for the CB,CC and CE transistor.
7. To plot output characteristics of FET & measure pinch-off voltage. Calculate FET parameters at a given operating point.
8. Design of P.S : 220/230 V (AC), 5VDC, 200 mA.
9. Plot the characteristic of varactor diode.
10. Plot the characteristic of schottky diode.
11. Plot the characteristic of photo diode.
12. Plot the characteristic of photo detector.
13. Plot the characteristic of LED.
14. Plot the characteristic of SCR diode.
15. Plot the characteristic of DIAC, TRIAC, IGBT.

DIGITAL ELECTRONICS LAB (20319)

1. Bread-board implementation of various flip-flops.
2. Bread-board implementation of counters & shift registers.
3. Determination of Delay time and NAND, NOR, Ex-OR, AND & OR Gates.
4. Transfer characteristics of TTL inverters & TTL Schmitt Trigger inverter.
5. Transfer characteristics of CMOS inverters series and CD40 series and estimation of Gate delay of CD40 series CMOS inverter.
6. Monoshot multivibrators using 74121 and 74123.
7. Clock circuit realization using 555 and CMOS inverter and quartz crystal.
8. Adder/ subtractor operation using IC7483 4 bit/ 8 bit.
9. Demultiplexer / Decoder operation using IC-74138.
10. Modulo N counter using programmable counter 74190.

ELECTRONICS LAB-II (20321)

1. Biasing of NPN CE transistor
2. Biasing of FET.
3. MOSFET as an amplifier.
4. Study of single stage RC-coupled BJT amplifier (frequency response. Max. signal handling capacity, input impedance)
5. Study of single RC coupled FET amplifier (frequency response, max. signal handling capacity, input impedance)
6. Study of Class AB/B ,push-pull amplifier.
7. Study of Cascode amplifier.
8. To realize emitter follower amplifier using Darlington pairs transistor and find the input impedance.
9. Study of tuned amplifier and construction of oscillators.
10. Realization of fixed frequency Wein-bridge oscillator.
11. Study of Crystal Oscillator.
12. Study of feedback circuits using transistor and OPAMPs.
13. Study of h parameter of BJT.

ELECTRONIC WORKSHOP & PCB LAB (20322)

(I) Winding Shop: Step down transformer winding of less than 5VA.

(II) Soldering shop: Fabrication of DC unregulated power supply

(III) PCB Lab: (a) Artwork & printing of a simple PCB.

(b) Etching & drilling of PCB.

(IV) Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.

(V) Testing of power supply fabricated.

Note: No design work is involved.

DATA STRUCTURES LAB (CS 451/20324)

Write Program in C++ for following.

1. Array implementation of Stack, Queue.
2. Implementation of Stack, Queue, Linked List using Dynamic memory Allocation.
3. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
4. Implementation of different Searching Algorithms.
5. Implementation of different sorting Algorithms.

Microprocessor Lab (20325)

8085/8086 Based Experiments :

1. Signed Multiplication using Booth's Algorithm.
2. Recursive routine for finding Factorial N.
3. Look up table method for finding the ASCII of an alphanumeric code.
4. Interfacing with 8255 in I/O mode/BSR mode.
5. Interfacing with 8253.
6. Verification of Interrupts.
7. Interfacing with ADC/DAC.
8. Mini Project on some interfacing applications.
9. Serial communication between two kits through RS-232C using 8251.

MICROCONTROLLER & EMBEDDED SYSTEMS
(3311)

UNIT-I: Introduction to Microcontrollers : Evolution, Microprocessors Vs Microcontrollers, MCS-51 Family ,Overview , Important features, Architecture. 8051 Pin Functions, Architecture, Addressing Modes, Instruction Set, Instruction Types.
Introduction to Intel 8096 and MC68HC11 microcontroller.

UNIT-II: Programming :Introduction to 8051 assembly language programming, The program counter and ROM space in the 8051,8051 data types and directives, 8051 flag bits and the PSW register,8051 register banks and stack, 8051 I/O programming, I/O bit manipulation programming.

UNIT-III: Interrupts : Programming the 8051 timers, Counter programming, Basics of serial communications,8051 connection to RS-232, 8051 serial port programming assembly, 8051 interrupts, Programming timer interrupts, programming external hardware interrupts, programming the Serial communication interrupts, Interrupts priority in the 8051.

UNIT-IV: Interfacing with 8051: Memory address decoding 8031/ 51 interfacing with external ROM, 8051 data memory space, LCD, Keyboard, Parallel and Serial ADC, DAC interfacing, Sensor interfacing and Signal Conditioning, Stepper motor and DC motor

UNIT-V: 4. Introduction to Embedded Systems
Background and History of Embedded Systems, Definition and Classification, Programming languages for embedded systems: desirable characteristics of programming languages for embedded systems, Low-level versus high-level languages, Main language implementation issues: control typing. Major programming languages for embedded systems. Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits.
Introduction to real time embedded systems with its components and examples.

Text Books:
1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and McKinlay Rolin D., " The 8051Microcontroller and Embedded Systems using Assembly and C", Pearson, 2nd Edition.
2. Chhabra Bhupendra Singh, "Microcontrollers & its Applications" Dhanpat Rai PublishingCompany

Reference Books:
1. Ayala Kenneth, "The 8051 Microcontroller", Cengage Learning, 3rd Edition
2. Shah Satish, " 8051 Microcontrollers MCS 51 Family and its variants", Oxford
3. Ghoshal Subrata, " 8051 Microcontroller Internals, Instructions, Programming andInterfacing"Pearson(24)

Analog Integrated Circuits (3312)

UNIT 1 IC OP-AMP applications:

OP-AMP Fundamentals (brief review of differential amplifier, current mirror, active load, level shifter, output stage;ac and dc characteristics) Basic building blocks using OP-AMPS. Inverting/Non-inverting VCVS, Integrators, Differentiators, CCVS andVCCS, Instrumentation Amplifiers.

UNIT 2 Waveform Generator:

Square wave generators: 555Timer, Crystal controlled Oscillator Ramp Generator: Triangle generator, Sawtooth generator Sine wave generator: Requirement for sinusoidal oscillations, Wien-bridge and twin-T oscillators. Function Generators: Multi op-amp function generators, IC function generators Digitally controlled frequency synthesizer: PLL Fundamentals, PLL synthesizer, Totally digital synthesizer.

UNIT 3 Active Filters:

Introduction to filtering: Frequency response, Characteristics and terminology, Active versus passive filters Low pass filter: First order low pass active filter, second order active filter model, second order low pass filter characteristics, Sallen-Key unity gain filter, Sallen-Key equal component filter, Higher order filters. High pass active filter. Band pass filter: single op-amp band pass filter, multistage band pass filter State variable filter

UNIT 4 Non-linear Circuits:

Logarithmic Amplifiers, Log/Antilog Modules, Precision Rectifier, Peak Detector, Sample and Hold Circuits. OP-AMP as Comparator, Schmitt Trigger, Square and Triangular Wave Generator, Monostable Multivibrator. IC Analog Multiplier applications OTA

UNIT 5 Voltage Regulators:

OP-AMP Regulators, IC Regulators, Fixed Voltage Regulators (78/79, XX), SMPS.

Text Book:

1. Sedra and Smith, Microelectronic Circuits", Oxford University press, 5th Edition, 2005.
2. J. Michael Jacob, Applications and design with Analog Integrated Circuits", PHI, 2nd Edition, 2004.

Reference Book :

1. B.P. singh and Rekha Singh, Electronic Devices an Integrated Circuits; Pearson Education, 1st Edition 2006.

Electronics and Communication Engineering, IET, BU

Vision & Mission of the Institute (IET)

Vision of Institute:

To emerge as an institution of excellence in engineering education and research that emphasizes on the human values, competence and professionalism integrated with the course curriculum as per global standards to serve the nation as well as the society with innovating mindset to take up any challenge they come across in industrial, scientific or academic fields within or outside the country.

Mission of Institute:

M1	To equip with the latest tools and equipment matching the state-of-art technologies to facilitate the academic and research activities at par with the best institutions.
M2	To inculcate a proper mix of creativity, innovation, competence, entrepreneurial leadership, and professionalism in the minds of the students so as to yield the internationally accepted best products.
M3	To provide proper ambiance for the teaching-learning system that preserves universal human values, ethics, and morals to meet the aspirations of all the stakeholders for sustainable development of the institute.
M4	To develop a potential pool of intellectuals and professionals that can serve anywhere efficiently in decision making and policy adoption according to the local, national and global needs

Vision & Mission of the Department (E&CE)

Vision of E&CE Department

To be a department as a center of excellence producing globally acceptable engineers and technologists in Electronics and Communication Engineering, to cater to the needs of industry, research & development organizations in Electronics and Communication Engineering, with an innovative mindset to take up any challenge they come across in industrial, scientific or academic fields within or outside the country.

Mission of E&CE Department

M1	To equip with the state-of-art technologies to support academic and research excellence in the field of Electronics and Communication Engineering.
M2	To inculcate knowledge and technical skills to create competent professionals, technocrats and entrepreneurs in Electronics and Communication Engineering by providing continuous training for skill development and adopting new technologies.
M3	To provide proper ambiance for effective interactions of students, faculty and management with the Electronics and Communication Engineering industry personnel, alumni, academicians of premier Institutions and other stakeholders for sustainable development of the department and its stakeholders.
M4	To cultivate strong and universal ethical values within the students in decision making and policy adoption for sustainable development of the society and the Engineering community.

PROGRAM OUTCOME (PO) for IET

PO1; Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis:

Identify, formulate, review and analyze complex engineering problems from the research papers and literature, and thereafter reach substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3; Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate cultural, societal, and environmental considerations for public health and safety.

PO4; Conduct investigations of complex problems:

Use research-based knowledge and methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5; Modern tool usage:

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6; The engineer and society:

Apply to reason informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities.

PO7; Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8; Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9; Individual and teamwork:

Function effectively as an individual, and as a member or leader in diverse teams and individual and in multidisciplinary settings relevant to the professional engineering practice.

PO10; Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11; Project management and finance:

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12; Life-long learning:

Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM OUTCOMES (PO) for E& CE Dept

On completion of the B. Tech degree the Electronics and Communication Engineering, the graduates will be able to

PO1: Apply the basic knowledge in mathematics, science and engineering to the solution of complex engineering problems in the field of Electronics and Communication Engineering.

PO2: Identify, formulate review, analyze and solve complex problems using first principles of mathematics, natural sciences, and engineering sciences and thereafter reach substantiated conclusions.

PO3: Design solutions for complex engineering problems and system components and offer solutions or processes to meet the specified needs of the cultural, societal and environmental concerns related to public health and safety.

PO4: Apply research-based knowledge and design methods and conduct experiments, analyze, synthesize and interpret data pertaining to Electronics and Communication Engineering problems so as to arrive at valid conclusions.

PO5: Construct, create and apply appropriate techniques, resources and modern engineering tools required for Electronics and Communication Engineering applications.

PO6: Apply the contextual knowledge to assess societal, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

PO7: Examine the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Apply ethical principles and social responsibilities to develop consciousness of professional ethics and responsibilities and norms of the engineering practice as an expert in the field of Electronics and Communication Engineering.

PO9: Function effectively as a member/leader in multidisciplinary and diverse teams or individual relevant to the professional engineering practice.

PO10: Communicate effectively the engineering activities with the engineering community and with society at large for being able to comprehend and write effective reports and documentation and make effective presentations.

PO11: Demonstrate knowledge and understanding of the engineering and management principles to manage projects in a multidisciplinary environment as a member and leader in a team, to manage projects.

PO12: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change in Electronics and Communication Engineering.

Program Specific Outcomes (PSO)

(for Electronics and Communication Engineering Dept)

On completion of the B. Tech degree the Electronics and Communication Engineering, the graduates will be able to attain the following program specific attributes in addition to 12 PO's mentioned:

PSO-1:

Analyse, design and simulate systems and applications that contain any electronics-based hardware component or module.

PSO-2:

Design and develop models related to communication engineering, control and automation sectors.

Program Educational Objectives (PEO)

PEO-1: Graduate will have successful professional careers with innovative ideas while serving the Government firm, industry, corporate, military academic and research organization or being an entrepreneur.

PEO-2: Graduate will be able to work effectively in different fields as a team member or individual with the ability of solving engineering problems with core expertise in analysis, design, networking, security, and development using advanced tools in electronics and communication systems.

PEO-3: Graduate will be able to develop themselves professionally by continuous learning and and advance their careers through activities such as participation in professional certification programs, and seeking higher education innovation and research while benefitting the society.

PEO-4: Graduate will be able to show the leadership in diverse cultures, nationalities and fields while working efficiently with interdisciplinary teams locally and internationally.

INSTITUTE OF ENGINEERING & TECHNOLOGY

BUNDELKHAND UNIVERSITY, JHANSI

DEPARTMENT
OF
ELECTRONICS &
COMMUNICATION ENGINEERING.

SYLLABUS

Department of Electronics & Communication Engineering, IET BU Jhansi

2022-2023

Minutes of the meeting of board of studies
(Academic session 2022-2023)

A meeting of the board of studies held on 16thNovember, 2022 at1.00P.M.to discuss the agenda provided vide letter no. BU/Acad /2022/7751-7761 dated15/11/22

Agenda:

1. To approve the panel of external & internal examiners for B.Tech. Electronics & Communication Engineering program at Institute of Engineering and Technology, Bundelkhand University, Jhansi.
2. To revise the syllabus.

The following members werepresent:

External Members:

1. Prof. P.K. Singhal, Professor, Department of Electronics & Communication Engineering, M.I.T.S., Gwalior (MP).**(Attended the meeting online)**
2. Er. Sudhir Kindo, Quality Control Engineer, B.H.E.L., Jhansi(UP)**(Industry Expert)**

Internal Members:

1. Prof. M M Singh (Convenor&Dean (Engineering), Bundelkhand University, Jhansi
2. Dr. Naushad Ather Siddiqui(Member),Department of Electronics & Communication Engineering,Institute of Engineering& Technology, Bundelkhand University, Jhansi
3. Er. Rajesh Kumar Verma,(Member),Department of Electronics & Communication Engineering, Institute of Engineering& Technology, Bundelkhand University, Jhansi
4. Er. Lakhan Singh(Member),Department of Electronics & Communication Engineering, Institute of Engineering& Technology, Bundelkhand University, Jhansi
5. Dr. Zakir Ali, Coordinator,Department of Electronics & Communication Engineering, Institute of Engineering& Technology, Bundelkhand University, Jhansi
6. Er. Shashikant Verma, (Member),Department of Electronics & Communication Engineering, Institute of Engineering& Technology, Bundelkhand University, Jhansi
7. Dr. Akanksha Gupta, (Member),Department of Electronics & Communication Engineering, Institute of Engineering& Technology, Bundelkhand University, Jhansi

8. Dr. Anupam Vyas, (Member),Department of Electronics & Communication EngineeringInstitute of Engineering& Technology, Bundelkhand University, Jhansi
9. Dr. Sakshi Dubey,(Member), Department of Electronics & Communication Engineering , Institute of Engineering& Technology, Bundelkhand University, Jhansi

Proceedings:

1. Incompliance of agenda point no. 1-the panel for external and internal examiners for the Odd & Even semesters theory and practical examinations was put up for 2022-23 and has been approved.
2. In purview of additional skill development to enhance employability, it has been proposed to include value added courses in the course curriculum of B. Tech (Electronics & Communication Engineering.)

   The proposal has been discussed thoroughly in length and it has been approved to include the value added courses in I, II, III, IV, V and VI semester. The students have to choose any one value added course in each semester from the list (attached).

   The course will be of non-evacuative and non-credit in nature. Each value added course shall be of 30 hrs. The course structure and syllabus of session 2022-23 is attached (copy attached).

Revised Courses and Evaluation Scheme
(Effective from the session: 2022-2023)
B.Tech. Electronics & Communication Engineering

Second Year, Semester-III

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Total			
1	2311	Mathematics -III	3	1	0	30	20	50	100	150	4
2	2312	NetworksAnalysis and Synthesis	3	1	0	30	20	50	100	150	4
3	2313	Electronic Measurements and Instrumentation	3	-	0	30	20	50	100	150	3
4	2321	Semiconductor Material &Devices	3	-	0	30	20	50	100	150	3
5	2322	Digital Electronics	3	-	0	30	20	50	100	150	3
Practicals / Training / Projects											
6	20316	Network Lab	0	0	2	-	-	20	30	50	1
7	20317	Instrumentation & Measurements Lab	0	0	2	-	-	20	30	50	1
8	20318	Electronics Lab I	0	0	2	-	-	25	50	75	1
9	20319	Digital Electronics Lab	0	0	2	-	-	25	50	75	1
10	20320	General Proficiency	-	-	-	-	-	50	-	50	
Grand Total			**15**	**2**	**8**					**1050**	**21**

TA- Teacher's Assessment, CT-Class Test,ESE- End Semester Examination

Revised Courses and Evaluation Scheme
(Effective from the session: 2022-2023)
B.Tech. Electronics & Communication Engineering

Second Year, Semester-IV

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Tot			
1	2316	Electromagnetic Field Theory	3	1	0	30	20	50	100	150	4
2	2317	Signals and Systems	3	1	0	30	20	50	100	150	4
3	2324	Electronic Circuits	3	-	0	30	20	50	100	150	3
4	2325	Microprocessor & Applications	3	-	0	30	20	50	100	150	3
5	2326	Programming in C++ & Data Structure	3	-	0	30	20	50	100	150	3
Practicals / Training / Projects											
6	20321	Electronics Lab II	0	0	2	-	-	25	50	75	1
7	20322	Electronics Workshop& PCB Lab	0	0	2	-	-	25	50	75	1
8	20324	Data Structure Lab	0	0	2	-	-	20	30	50	1
9	20325	Microprocessor Lab	0	0	2	-	-	20	30	50	1
10	20326	General Proficiency	-	-	-	-	-	50	-	50	
Grand Total			**15**	**2**	**8**					**1050**	**21**

TA- Teacher's Assessment, CT-Class Test,ESE- End Semester Examination

Revised Courses and Evaluation Scheme
(Effective from the session: 2022-2023)
B.Tech. Electronics & Communication Engineering

Third Year, Semester-V

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Total			
1	3311	Microcontroller & Embedded Systems	3	-	0	30	20	50	100	150	3
2	3312	Analog Integrated Circuits	3	-	0	30	20	50	100	150	3
3	3313	Principles of Communication	3	-	0	30	20	50	100	150	3
4	3314	Antenna & Wave Propagation	3	1	0	30	20	50	100	150	4
5	3315	Automatic Control System	3	1	0	30	20	50	100	150	4
Practicals / Training / Projects											
6	30316	Microcontroller Lab	0	0	2	-	-	25	50	75	1
7	30317	Analog Integrated Circuit Lab	0	0	2	-	-	25	50	75	1
8	30318	Communication Lab I	0	0	2	-	-	20	30	50	1
9	30319	Seminar	0	0	2	-	-	50	-	50	1
10	30320	General Proficiency	-	-	-	-	-	50	-	50	
		Grand Total	**15**	**2**	**8**					**1050**	**21**

TA- Teacher's Assessment, CT-Class Test,ESE- End Semester Examination

Revised Courses and Evaluation Scheme
(Effective from the session: 2022-2023)
B.Tech. Electronics & Communication Engineering

Third Year, Semester-VI

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Cred
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Tot			
1	3316	Microwave Engineering	3	-	0	30	20	50	100	150	3
2	3317	Digital Communication	3	-	0	30	20	50	100	150	3
3	3318	VLSI Technology & Design	3	-	0	30	20	50	100	150	3
4	3319	Electronic Switching	3	1	0	30	20	50	100	150	4
5	3320	Industrial Management	3	1	0	30	20	50	100	150	4
Practicals / Training / Projects											
6	30321	Microwave Lab	0	0	2	-	-	25	50	75	1
7	30322	Communication Lab II	0	0	2	-	-	25	50	75	1
8	30323	Electronics CAD Lab	0	0	2	-	-	20	30	50	1
9	30324	Minor Project	0	0	2	-	-	20	30	50	1
10	30325	General Proficiency	-	-	-	-	-	50	-	50	
Grand Total			**15**	**2**	**8**					**1050**	**21**

TA- Teacher's Assessment, CT-Class Test,ESE- End Semester Examination

Revised Courses and Evaluation Scheme
(Effective from the session: 2022-2023)
B.Tech. Electronics & Communication Engineering

Fourth Year, Semester-VII

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Total			
1	4311	Open Elective	3	1	0	30	20	50	100	150	4
2	4312	Digital Signal Processing	3	-	0	30	20	50	100	150	3
3	4313	Optical Fiber Communication	3	-	0	30	20	50	100	150	3
4	4314	Elective I	3	-	0	30	20	50	100	150	3
5	4315	Elective II	3	-	0	30	20	50	100	150	3
Practicals / Training / Projects											
6	40316	Digital Signal Processing Lab	0	0	2	-	-	25	50	75	1
7	40317	Communication Lab III	0	0	2	-	-	25	50	75	1
8	40318	Industrial Interaction	0	0	2	-	-	50	-	50	1
9	40320	General Proficiency	-	-	-	-	-	50	-	50	
Grand Total			**15**	**1**	**6**					**1050**	**19**

Note : 4 to 6 week Industrial Training after VI semester to beevaluated in

VII semester.

TA- Teacher's Assessment, CT-Class Test,ESE- End Semester Examination

Revised Courses and Evaluation Scheme
(Effective from the session: 2022-2023)
B.Tech. Electronics & Communication Engineering

FourthYear, Semester-VIII

S. NO.	Theory Papers		Periods			Evaluation Scheme				Total	Credit
	Paper Code	Paper Name	L	T	P	Sessional			ESE		
						CT	TA	Total			
1	4316	Wireless Communication	3	-	0	30	20	50	100	150	3
2	4317	Data Communication Network	3	-	0	30	20	50	100	150	3
3	4318	Elective III	3	-	0	30	20	50	100	150	3
4	4319	Elective IV	3	-	0	30	20	50	100	150	3
Practicals / Training / Projects											
5	40321	Major Project*	0	0	14	-	-	200	200	400	7
6	40322	General Proficiency	-	-	-	-	-	50	-	50	
		Grand Total	**12**	**0**	**14**					**1050**	**19**

*** Out of 14 periods, 2 periods per week should be allotted for interaction of group with project guide and 12 periods per week should be allotted for self studies and project work.**

TA- Teacher's Assessment, CT-Class Test,ESE- End Semester Examination

DEPARTMENTAL ELECTIVES

ELECTIVE – I

1. EC 011- Digital System Design Using VHDL
2. EC 012 -Fundamentals of Radar & Navigation
3. **EC 013- Artificial Neural Networks**
4. EC 014 -Speech Processing

ELECTIVE – II

1. EC 021- Principles of Secure Communication
2. EC 022 -Spread Spectrum Systems
3. EC 023- Filter Design
4. **EC 024- Satellite Communication**

ELECTIVE – III

1. EC 031 -Digital Image Processing.
2. EC 032- Adaptive Signal Processing
3. EC 033 –Micro & Smart Systems
4. **EC 034- Biomedical Signal Processing**

ELECTIVE – IV

1. **EC 041- Random Signal Theory**
2. EC 042 – Real Time Systems
3. EC 043 -Optical Networks
4. EC 044- Advanced Digital Design using Verilog

OPEN ELECTIVES

S.NO.	PAPER CODE	PAPER NAME	Department
1.	OE 01	Non-conventional Energy Resources	Electrical
2.	OE 02	Reliability Engineering	Electrical
3.	OE 03	Environment & Ecology	Civil
4.	OE 04	Geographic Inf. System (GIS) Technology & its Applications	Civil
5.	**OE 05**	**Entrepreneurship Development Program**	**Humanities**
6.	OE 06	Ancient Indian Culture	Humanities
7.	OE 07	Human Values	Humanities
8.	OE 08	Quality System & Management	Mechanical
9.	OE 09	Condition Monitoring & Diagnostics	Mechanical
10.	OE 10	Value Engineering	Mechanical
11.	OE 11	Nanotechnology	Mechanical
12.	OE 12	Solar Energy	Mechanical
13.	OE 13	Human Resource Management	Mechanical
14.	OE 14	Advance Material Science	Mechanical
15.	OE 15	Industrial Instrumentation	Instrumentation & Control
16.	OE 16	Biomedical Engineering	Instrumentation & Control
17.	OE 17	Fundamentals of Coding Theory	Electronics & Communication
18.	OE 18	Consumer Electronics	Electronics & Communication
19.	OE 19	Artificial Neural Networks & Fuzzy Logic	Electronics & Communication
20.	OE 20	Human Computer Interaction	Computer Science
21.	OE 21	I T in Business	Information Technology
22.	OE 22	Artificial Intelligence in Manufacturing	Manufacturing Technology
23.	OE 23	Health, Hospital and Equipment Management	Biomedical Engineering
24.	OE 24	Introduction to Medical Physics	Biomedical Engineering
25.	OE 25	Modern Control System	Electrical
26.	OE 26	Mechatronics	Electrical
27.	OE 27	SCADA & Energy Management System	Electrical

Note: The students will choose any one subject of the course of other than their Engineering branch.

VALUE ADDED COURSES

S.NO.	Semester	Paper Code	PAPER NAME
1.	I	VAD 01	Photography
2.		VAD 02	Google Ads
3.		VAD 03	Goal Setting
4.	II	VAD 04	Cyber security & ethical hacking
5.		VAD 05	Digital marketing
6.		VAD 06	Bio-CNG (Green Fuel)
7.	III	VAD 07	IELTS | IID
8.		VAD 08	Mushroom Cultivation Business
9.		VAD 09	Introduction to MATLAB
10.	IV	VAD 10	E- waste recycling business
11.		VAD 11	Advance Excel
12.		VAD 12	Mobile App Development
13.	V	VAD 13	Internet of things (IOT)
14.		VAD 14	Bakery Technology
15.		VAD 15	Drone technology
16.	VI	VAD 16	Marketing Content Writer
17.		VAD 17	Milk Processing Business
18.		VAD 18	Organic Waste Management

Note-

- ✓ The Students have to choose any one value added course in each semester from the list.
- ✓ The course will be of no - evaluative and non – credit in nature
- ✓ Each value-added course shall be of 30 hrs.

THEORY SEMESTER-3

<table>
<tr><td>Course Title</td><td colspan="5">Engineering Mathematics III</td></tr>
<tr><td>Course code</td><td colspan="5">MA 301</td></tr>
<tr><td rowspan="2">Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">Semester III</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="5">Basic Knowledge of Elementary mathematics</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To solve and evaluate the problem on complex
• Statistics
• Applications of probability on daily life problems</td></tr>
<tr><td colspan="6">Course Outcomes
Student gets good knowledge about complex problems and their implementation.</td></tr>
<tr><td>CO1</td><td colspan="3">Able to understand analytic function , CR equation in complex analysis and their implementation</td><td colspan="2">Understanding</td></tr>
<tr><td>CO2</td><td colspan="3">Able to understand how to calculate moment, skewness curve fitting and their implementation</td><td colspan="2">Understanding</td></tr>
<tr><td>CO3</td><td colspan="3">Able to understand distributions, Sampling theory (small and large), Tests of significations: Chi-square test, t-test, Analysis of variance (one way) , Application to engineering, medicine, agriculture etc.</td><td colspan="2">Understanding</td></tr>
</table>

CO4	Able to apply Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method to find the value of x	Applying
CO5	Able to solve system of linear equations by different methods like : Gauss- Seidal method, Crout method.	Understanding

Detailed Contents Engineering Mathematics III EC-III			
Modules	**Contents**	**L(Hours)**	**T (Hours)**
I	**Function of Complex variable:** Analytic function, C-R equations, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic function, Taylor's and Laurent's series, singularities, Residue theorem, Evaluation of real integrals of the type and	12	-
II	**Statistical Techniques – I**: Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non –linear and multiple regression analysis, Probability theory.	8	-
III	**Statistical Techniques – II**: Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations: Chi-square test, t-test, Analysis of variance (one way) , Application to engineering, medicine, agriculture etc. Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, , R, p, np, and c charts.	9	-
IV	**Numerical Techniques – I:** Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods. Interpolation: Finite differences, difference tables, Newton's forward and backward interpolation , Lagrange's and Newton's divided difference formula for unequal intervals.	8	-
V	**Numerical Techniques –II**: Solution of system of linear equations, Gauss- Seidal method, Crout method. Numerical differentiation, Numerical integration , Trapezoidal , Simpson's one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous) equations by Euler's, Picard's and forth-order Runge- Kutta methods.	7	-
	Total	**44**	**-**

Suggested Books

S.N.	**AUTHOR**	**TITLE**

1	Peter V. O'Neil	Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2	Jain, Iyenger & Jain	Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi , 2003
3	J.N. Kapur	Mathematical Statistics, S. Chand & company Ltd.,2000
Electronics materials, Web Site, etc: www.nptel.ac.in		

THEORY SEMESTER -3

1	Course Title	**Network Analysis & Synthesis**					
2	Course Code	**EC 2312**					
3	Schemes and Credit	L	T	P	C	Sem-III	
		3	1	0	4		
4	Program(s) in which the course is offered	**B.Tech.ECE Branch**					
6	Pre-requisites for this course (if any):	**1.Elementary Mathematics** **2. Basic of Electrical Engineering**					

Aim & Objectives

Aim of the Course	The aim of Network Analysis & Synthesis is to analysis network through Finding the value of voltage and current across load in simplified form and also realize a network. .
The Course objectives :	• Solve the network in simplified form. • To analyze the network. • Reasoning. • Perception. • Ability to Learn. • Imprecise knowledge. • Planning

Course Outcomes

- On the successful completion of the course, students will be able to:

CO1	Understand the concept of Graph, tree and cotree , Also find the matrices of basic of loop ,tie and cut set matrices and Duality to solve the currents flowing around complex circuits.	Understand

CO2	Analyze the current and voltage of complex network by using different theorems such as The venin and Norton equivalents for one-port network to be reduced to a single voltage source and single impedance	Analyze
CO3	Analyze the circuit through poles and zeros method and also find the time response and stability of a network	Analyze
CO4	Understand the concept of two port networks and concept of complex frequency.	Understand
CO5	Understand a working procedures in terms of a network related activities.	Understand

Detailed Contents

Module	Contents	L(Hours)	T (Hours)
I	Concept of Network graph, Tree, Tree branch, link and co tree, Incidence matrix, cut set and tie set matrices, dual networks, Loop and Node method of analysis.	9	2
II	Application of AC networks Thevenin's & Norton's, Super positions, Reciprocity, Compensation, Maximum power transfer, Millman's theorem, Tellegen's theorem,	9	2
III	Concept of complex frequency, Transfer function and Impedance function, Network function of One port and two port networks, concept of poles and zeros, property of driving point and transfer function, Frequency response and Bode plot, Transient response of RL ,RC,RLC for DC and sinusoidal excitation, Initial condition, Solution using differential equation and Laplace transform.	12	3
IV	Characterization of LTI two port networks Z, Y, ABCD, Hybrid parameters, reciprocity and symmetry .Inter-relationships between the parameters , interconnection of two ports networks, Ladder and lattice networks, T & pi Representation.	10	2
V	Positive real function, definition and properties of LC ,RC and RL driving point functions, synthesis of LC ,RC and RL driving point immitance functions using Foster and Cauer first and second forms.	13	2
	Total	**53**	**11**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes, PO: Program Outcomes,

PSO: Program Specific Outcomes

Suggested Books

AUTHOR	TITLE
M.E. Van Valkenburg	Network Analysis,3rd Ed ,2019
S P Ghosh A K Chakraborty	Network Analysis & Synth.,2009
Sudhakar	Circuit Network Analysis & Synth,5th Ed,2017
Bhattacharya and Singh	Network Analysis & Synth,1st Ed 2015

Study Material E link--https://archive.nptel.ac.in/courses/108/105/108105159/

Theory Semester -3

CourseTitle	**ELECTRONICS MEASUREMENTS AND INSTRUMENTATION**				
Coursecode	**EC-2313**				
Category	Professional Core Course				
SchemeandCredits	L	T	P	Total	Semester3rd
	3	0	2	5	
Prerequisites (ifany)	**1Measuring instrument capability. The measuring instrument must be capable of completing the measurement task adequately** **2.Long-term stability, Usability. ...** **Cost efficiency, Speed, Flexibility, Future-proof technology.**				
Course Objectives	• Explain basic concepts and definitions in measurement. • Describe the bridge configurations and their applications. • Elaborate discussion about the importance of signal generators and analyzers in • Measurement				

Course Outcomes

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

CO1	Recognize the evolution and history of units and standards in Measurements	Understanding
CO2	Identify the various parameters that are measurable in electronic instrumentation.	Understanding
CO3	Employ appropriate instruments to measure given sets of parameters.	Understanding
CO4	Practice the construction of testing and measuring set up for electronic systems.	Applying
CO5	To have a deep understanding about instrumentation concepts which can be applied to Control systems. Relate the usage of various instrumentation standards.	Evaluating

Detailed Contents

Module	Contents	L (Hours)	T (Hours)
I	Theory of Measurement Introduction, Types of Error, Error analysis: uncertainity analysis, statistical analysis, Gaussian error distribution, Precision.	9	-
II	Transducers :Passive transducers: Resistive, Inductive and capacitive,Active transducers : Thermoelectric, piezoelectric & photoelectric	9	-
III	Analog Meters AC analog meters: Principle of operation ,Average, Peak and RMS responding voltmeters, sampling, voltmeters.Electronic Analog meters: Electronics analog DC and AC voltmeter and ammeters, Electronic, analog ohmmeter and multimeter,	9	-
IV	Digital Meters:Digital Voltmeter, digital multimeter, Display devices :indicating system, numeric & alpha number display, LCD & LED, specification of digital meters: display digit & counts resolution, sensitivity accuracy, speed & settling time etc.	9	-
V	Oscilloscopes & Bridges:Types of oscilloscopes, controls, Measurements voltage, frequency time & Phase. High frequency measurements. Horizontal & Vertical Deflection System of CRT. Bridges: Direct current and alternating current bridges, LCR bridges	9	-
VI	Function Generators & Analyzers:Function Generators: Sine-wave, non- sinusoidal, frequency synthesis techniques & digital signal generators.Signal Analyzers: Distortion, wave and spectrum analyzers, nelvovk anadyzers.		
	Total	**45**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes, PO: Program Outcomes, PSO: Program Specific Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	MMS Anand, PHI Pvt. Ltd., New Delhi Ed.	Electronic Instruments & Instrumentation Technology
2	H.S. Kalsi TMH Ed.	Electronics Instrumentation
3	w.D. cooper &A.D. Helfrick, PHI 3rd Ed.	Electronics Instrumentation & Measurement Techniques
4	Oliver & Cage Mc-Graw Hill.	.Electronic Measurement & Instrumentation

Theory Semester -3

Course Title	Semiconductor Material & Devices				
Course Code	**EC-2321**				
Category	Professional Core course				
Scheme and Credits	L	T	P	C	Semester III
	3	0	0	3	
Pre-requisites for this course (if any):	**1.knowledge Semiconductor Devices** **2. Knowledge optics**				
The Course objectives are to	• Impart knowledge of the basic of materials used to construct electronic circuits devices. • Impart knowledge of the basics of opto- electronics devices. • calculation and measurement of parameters for electronic circuits • designing electronic circuits, • performance analysis of electronic circuits.				

Course Outcomes:
After completing this course students are able to:

CO1	Explain the theoretical aspect essential for understanding the material used in electronics devices	Understand
CO2	Measure the characteristics of electronic circuits and present experimental results.	Analyze and design
CO3	Students able to use optical device in small projects like(Photo diode, LDR, Optical transistor	Design
CO4	Analyze electrical circuits and calculate the main parameters	Analyze and design
CO5	Develop, design and create simple analogue and digital electronic circuits choose an engineering approach to solving problems, starting from the acquired knowledge essential for the design of electronic circuits	Design

Detail Contents

Module	Contents	L	T
I	Elemental and compound semiconductor materials **,** crystal lattice structure, Bonding forces an bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in ele magnetic fields.	8	
II	Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carrier	6	
III	Equilibrium conditions, biased junctions, steady state conditions, break down mechanism, Transient conditions, metal semiconductor junction, hetero junctions Varactor Diode, switching diodes and Schottky diodes.	10	
VI	Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs, metal semiconductor field effect transistors (MESFET), metal insulator semiconductor field effect transistors (MISFET), Construction, Operation and characteristics of MISFET, Construction, Operation and characteristics of MESFET, Photodiodes, photo detectors, solar cell light emitting diodes light emitting materials, optical fiber, semiconductor lasers, material for semiconductor lasers	9	
V	Tunnel diodes, degenerate semiconductors, transit time device: the IMPATT diode, transferred electron mechanism: The GUNN diode, four-layer devices: P-N-P-N diode, semiconductor-controlled rectifier (SCR), bilateral devices: DIAC, TRIAC, IGBT	7	
	Total	40	

Suggested Book

S.No.	Author	Title
1	Ben G. Streetman, Sanjay Kumar Banerjee	Solid State Electronic Devices
2	JB Gupta	Semiconductor Materials and Devices
3	Study Material Link	https://www.youtube.com/watch?v=h0Y9jDKqScQ&list= PLgMDNELGJ1CaNcuuQv9xN07ZWkXE-wCGP

THEORY SEMESTER-3

Course Title	**Digital Electronics**				
Course code	Course Code-2322				
Scheme and Credits	L	T	P	C	Semester iii
	3	0	0	3	
Pre-requisites(if any)	**Knowledge of Different types of Electronic Digital circuits.**				
Course Objectives	❖ The objective of this course is to provide the fundamental concepts associated with the digitallogic and circuit design. ❖ To introduce the basic concepts and laws involved in the Booleanalgebra and logic families and digital circuits. ❖ To familiarize with the different number systems,logic gates, and combinational and sequential circuits utilized in the different digital circuits andsystems. ❖ The coursewillhelp indesign andanalysisof thedigitalcircuit andsystem ●				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Became familiar with the digital signal, positive and negative logic, Boolean algebra, logicgates, logical variables, the truth table, number systems, codes, and their conversion from toothers.				**Understanding**
CO2	Learn the minimization techniques to simply the hardware requirements of digital circuits,implementit, design andapplyfor realtimedigitalsystems.				**Learning**
CO3	Understand the working mechanism and design guidelines of different combinational,sequentialcircuits and their role in thedigital system design.				**Understanding**

CO4	Became able to know various types of components-ADC and DAC, memory elements andthe timing circuits to generate different waveforms.	**Applying**

Detailed Contents Digital Electronics-EC-2322			
Modules	**Contents**	**L(Hours)**	**T (Hours)**
I	Number systems and their interconversions.Binary Arithmetic: (Addition, Subtraction, Division and Multiplication) Diminished radix and radix compliments ,BCD codes and Grey Codes, Excess 3 Codes, and Hamming Codes, Digital Logic Gates, NAND and NOR implementation, Boolean Algebra and Boolean Functions, Canonical and Standard form map method 2 Variables, 3 variables, 4 variablesSum of Product and Product of Sum, Simplification	8	-
II	Binary Adders and Subtractors, Binary Multipliers and Magnitude Comparators, Multiplexers/ Demultiplexers, Encoders/Decoders, Decimal Adders, ROM as Decoder.	12	-
III	Introduction to Flip flopsSR Flip Flops, JK Flip Flops, D Flip Flops, T Flip Flops, Master Slave Flip Flops, Excitation Table, Interconversions of Flip Flops, Classification of Sequential Circuits, Design of Shift Registers, Synchronous Counters and Asynchronous CountersRing CountersJohnson Counter and its Applications	10	-
IV	A to D and D to A ConverterDiodeBJT and MOS as a switching element concept of transfer characteristicsInput characteristics and Output Characteristics of Logic GatesFan-in, Fan-out, Noise MarginCircuit ConceptLogic Families: (RTL, DTL, TTL)Logic Families: (IIL, ECL)Logic Families: (NMOS, CMOS, Tri-state logic)Open Collector Output, Totem PoleInterfacing between Logic Families, Packing DensityPower Consumption and Gate Delay	10	-

V	Sequential and Random Access memory, NMOS and CMOS static and dynamic memory elementsOne and Multi-Dimensional Selection ArrangementRead Only Memories, Formation of Memory BanksPLA, PAL.	7	-
VI	Representation ofSequential Circuits using ASM Charts, Synthesis of Output and Next State Functions, Data Path, Control Path Partition-Based Design	4	
	Total	**51**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	ris Mano,	l Design 2ND edition PHI

Electronics materials, Web Site, etc:www.tutorialspoint.comwww.nptel.ac.in

LABORATORY **SEMESTER-3**

Course Title	Network Lab				
Course code	**EC-20316**				
Scheme and Credits	L	T	P	C	Semester -III
	-	0	2	1	
Pre-requisites(if any)	**1.Elementary Mathematics 2. Basic of Electrical Engineering**				
Course Objectives	• Solve the network in simplified form. ,Analyze the network,Reasoning.,Perception. • Ability to Learn,Imprecise knowledge,Planning				

Course Outcomes: On the successful completion of the course, students will be able to:

CO1	Understand the concept of Graph, tree and cotree , Also find the matrices of basic of loop ,tie and cut set matrices and Duality to solve the currents flowing around complex circuits.	Understand
CO2	Analyze the current and voltage of complex network by using different theorems such as The venin and Norton equivalents for one-port network to be reduced to a single voltage source and single impedance	Analyze
CO3	Analyze the circuit through poles and zeros method and also find the time response and stability of a network	Analyze
CO4	Understand the concept of two port networks and concept of complex frequency.	Understand
CO5	Understand a working procedures in terms of a network related activities.	Understand

Network Lab EC- 20316

S.no	**Contents**
1	Verification of principle of superposition with de and ac sources
2	Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3	Verification of Tellegen's theorem for two networks of the same topology
4	Determination of transient response of current in RL and RC circuits with step voltage input
5	Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases.
6	Determination of frequency response of current in RLC circuit with sinusoidal ac input
7	Determination of z and h parameters (de only) for a network and computation of Y and ABCD
8	Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values
9	Determination of image impedance and characteristic impedance of T and II networks, using O.C. and S.C. tests
10	Verification of parameter properties in inter-connected two port networks: series, parallel and cascade also study loading effect in cascade
11	Determination of frequency response of a Twin-T notch filter

LABORATORY SEMESTER-3

Course Title	INSTRUMENTATION & MEASUREMENT LAB				
Course code	**EC**-20317				
Scheme and Credits	L	T	P	C	Semester 3rd
		0	2	1	
Pre-requisites(if any)	**1. Knowledge of Measuring instrument capability. 2. Knowledge of The measuring instrument must be capable of completing the measurement task adequately.**				
Course Objectives	**1.The objective of this Lab is to help students understand the use of sensors, transducers and measuring instruments.** **2.The lab also focuses on how AC and DC measuring devices work and provides an insight of construction of these devices.** **3.The lab also gives hands on experience to the students of different measuring devices.**				

Course Outcomes: On the successful completion of the course, students will be able to:

CO1	Able to learn different measuring instruments for the measurement of various electrical and non-electrical parameters.	Understanding
CO2	Design and analyze Select various transducers for the measurement of physical quantities like temperature, pressure, distance and displacement.	Analyzing
CO3	Compute the errors present in measuring instruments and calibrate them.	Analyzing
CO4	Examine AC bridges for the measurement of inductance, capacitance and frequency.	Analyzing
CO5	Able to understand Analyze the characteristics of Solar panel, earth resistance and temperature transducers.	Understanding

INSTRUMENTATION & MEASUREMENT LAB -20317

Sno.	**Contents**
1	1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter. (i) PT-100 trans (i) J- type trans. (ii) K-type trans (iv) Presser trans
2	2. Study of L.C.R. bridge and determination of the value of the given components.
3	3. Study of distortion factor meter and determination of the % distortion of the given osCillator.
4	4. Study of the transistor tester and determination of the parameters of the given transIstors
5	5. Study of the following transducer
6	6. Measurement of phase difference and frequency using CRO (lissajous figure)
7	7. Measurement of low resistance Kelvin's double bridge.
8	8. Radio Receiver Measurements
9	9. RF Low and High Power Measurements

LABORATORY SEMESTER-3

Course Title	Electronics lab-1				
Course Code	**20318**				
Scheme and Credits	L	T	P	C	Semester III
	0	0	2	1	
Pre-requisites for this course (if any):	**1.knowledge of semiconductor Devices** **2. Knowledge basic component**				
Course Objective	1. The lab course will give a practical exposure to students to learn the characteristics of Devices and there circuits. 2. To gain the practical hands on experience by exposing student to various Semiconductor Devices .				

Course Outcomes: on completion of this lab course student will be able to:

CO1	Able to handle different Equipment like CROs, multi-meter and power supplies.	Understand
CO2	Able to understand analyze diodes circuits	Analyze
CO3	Able to understand different circuits of FET'S and BJT's	Design
CO4	Able to design regulated power supplies and circuit	Design
CO5	Demonstrate various characteristics of Diodes, BJT's and FET's	Demonstrate

List of Experiments: (At least 8 experiments should be conducted from the list of experiments.)

1	Study of CRO and multimeter applications
2	Plot V-I characteristics of Junction diode under forward and reverse-biased condition(Si & Ge).
3	Draw the wave shape of electrical signal at input and output points of the half wave, full wave and bridge rectifiers
4	Plot the V-I characteristics of Zener Diodes.
5	Realize a voltage regulator using zener diode and study the load characteristics.
6	Plot the input output characteristics for the CB, CC and CE transistor.
7	To Plot output Characteristics of FET and measure pinch-off voltage. Calculate FET parameters at a given operating point.
8	Design of P.S 220/230 V(AC), 5 VDC, 200mA
9	Plot the characteristics of Varactordiode.
10	Plot the characteristics of Schottky diode
11	Plot the characteristics of photo diode
12	Plot the characteristics of photo detector
13	Plot the characteristics of LED
14	Plot the characteristics of SCR
15	Plot the characteristics of DIAC, TRIAC, IGBT.

LABORATORY SEMESTER-3

Course Title	Digital Electronics Lab				
Course code	**EC-20319**				
Scheme and Credits	L	T	P	C	Semester iii
		0	2	1	
Pre-requisites(if any)	**1. Knowledge of basic electronics.** **2. Knowledge of digital circuit.**				
Course Objectives	• To become familiar with fundamental of digital circuit. • To design and implement the circuits to gain knowledge on performance of the circuit and its application • To analyze various digitalcircuit half adder and Subtractor. • Familiar with number system. To know the Basic Gates, SOP, POS, flip flop, counter circuit				
Course Outcome: On the successful completion of the course, students will be able to:					
CO1	Able to learn the fundamentals of various Digital circuit.				Understanding
CO2	Design and analyze basic Gates.				Analyzing
CO3	Design and analyze half adder,, full adder and subtractor.				Analyzing
CO4	Able to analyze counter circuit				Analyzing
CO5	Able to understand flip flop.				Understanding

Digital ElectronicsLab EC- 20319

Sno.	Contents
1	Bread-board implementation of counters & shift registers.
2	Determination of Delay time and NAND, NOR, Ex-OR, AND & OR Gates.
3	Transfer characteristics of TTL inverters & TTL Schmitt Trigger inverter.
4	Transfer characteristics of CMOS inverters series and CD40 series and
5	Estimation of Gate delay of CD40 series CMOS inverter.
6	Monoshot multivibrators using 74121 and 74123.
7	Clock circuit realization using 555 and CMOS inverter and quartz crystal.
8	Adder/ subtractor operation using IC7483 4 bit/ 8 bit.
9	Demultiplexer / Decoder operation using IC-74138.
10	Implementation of Basic gates.

THEORY SEMESTER - 4

Course Title	**Electromagnetic Field Theory**				
Course code	**EC-2316**				
Scheme and Credits	L	T	P	C	Semester **IV**
	3	1	0	4	
Pre-requisites (if any)	**Vector Calculus**				
Course Objectives	1. To study different coordinate systems to understand the concepts of gradient, divergence and curl. 2. To study static electric field, Energy, Potential, capacitances, current density, Boundary conditions. 3. To study steady magnetic field and magnetic materials. 4. To discuss time varying fields , Maxwell's Equations, Poynting theorem and Propagation of EM waves. 5. To Introduce the concept of transmission lines and impedance matching.				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	To use different coordinate systems to explain the concept of gradient, divergence, and curl .				Understanding
CO2	To know electric field intensity, electric flux density, Gauss's Law Potential, Potential Gradient, Poisson's and Laplace's equations, Current Density, Continuity Equation and Boundary conditions.				Understanding
CO3	To know Biot-Savart's Law, Ampere's Circuital Law, Scalar and Vector Potentials and Nature of magnetic materials.				Understanding

CO4	To State and derive Poynting theorem, Physical significance and derivation of Maxwell's equations. To explain the fundamental concepts about electromagnetic waves, wave propagation in different media, Reflection and Refraction of EM waves.	Understanding and Applying
CO5	To know about transmission lines, derivation of transmission line equations and impedance matching techniques.	Understanding

Detailed Contents : Electromagnetic Field Theory EC - 2316			
Modules	**Contents**	**L (Hrs)**	**T (Hrs)**
I	Review of vector analysis, Scalar & vector products, gradient, divergent and curl of a vector and their physical explanation-Transformation amongst rectangular, cylindrical and spherical co-ordinate system.	10	2
II	Coulomb's law, electric field intensity from point charges, field due to continuous distribution of charges, gauss's law, Electric displacement and displacement density potential function, potential field of a point charge, Laplace's and poison's equations.	9	2
III	Magnetic field intensity and magneto motive force, Ampere's Circuital law, Energy stored, Biot-savart law, vector potential, magnetic dipole.	6	1

IV	Ampere's work law in differential vector form, continuity of currents, conduction and displacement current. Maxwell's equations and their interpretations, boundary conditions. Wave equations, sinusoidal time varying fields, uniform plane wave in dielectric and conductor media, skin effect and depth of penetration, reflection and refraction of plane waves at boundaries for normal . Poynting theorem, interpretation of E×H, Simple application, complex poynting vector.	8	2
V	Transmission line theory from the circuit concept, properties; constants, transmission line equations; infinite line; reflections in transmission lines; voltage, current and impedance relations-open and short circuit lines. Standing wave ratio; impedance matching, quarter and half wave lines single stub and double stub matching;	6	2
	Total	**39**	**9**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	MNO Sadiku,	"Elements of Electromagnetic', Oxford University Press. 7th edition.
2	S. P. Seth,	"Elements Of Electromagnetic Fields", Dhanpat Rai & Co
3	Hayt, W.H. and Buck, J.A.	"Engineering Electromagnetics", Tata McGraw Hill Publishing Co. Ltd., New Delhi Seventh edition

Electronics materials, Web Site, etc: www.nptel.ac.in

THEORY SEMESTER-4

Course Title	**Signal and System**				
Course code	Course Code-2317				
Scheme and Credits	L	T	P	C	Semester iv
	3	0	0	3	
Pre-requisites(if any)	**Knowledge of Different types of signals**				
Course Objectives	● This course deals with the basics of signals and systems analysis . ● different operations on discrete- time and continuous-time signals ● study of different systems (linear, non-linear, time variant, time-invariant, stable and unstable systems)				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Define signals and systems, classify the signals and apply different operations on signal.				Understanding
CO2	Explain the Force Voltage analogy and Force Current analogy.				Realization
CO3	Determine Fourier series coefficient and Fourier transforms for different types of signals.				Analysis
CO4	Determine Laplace transforms with their properties by using the concept of ROC.				Analysis
CO5	Determine Z transforms with their properties by using the concept of ROC and relate with Laplace transform.				Evaluated

Detailed Contents Signal and System-EC-2317

Modules	Contents	L(Hours)	T (Hours)
I	INTRODUCTION**:** Signals and Systems Continuous-time and discrete-time S Transformations of the Independent Variable, Exponential and Sinusoidal S Continuous-Time and Discrete-Time LTI Systems and their properties, conv sum and convolution integrals, LTI System described by differential and dif equation	8	-
II	Fourier Series and Fourier Transformer The response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-time Periodic Signals and their Properties, Continuous time and discrete time Fourier Transforms and their properties, System Characterized by Linear Constant Coefficient Differential equations and Difference equation.	12	-
III	Time and Frequency Characterization of Signals and Systems Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency response of LTI systems, Time domain Properties of Ideal Frequency Selective filter, Time Domain and Frequency Domain aspects of Non ideal filters, First Order and Second Order Continuous Time and Discrete time Systems	9	-
IV	Sampling and Laplace Transform Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals.Laplace Transform, Region of convergence, inverse Laplace Transform, Analysis and characterization of LTI System, Block diagram representation, Unilateral Laplace transform.	8	-
V	Transform Z-Transform, Region of convergence, Inverse Z-transform, analysis and characterization of LTI system, Block diagram representation, Unilateral Z-transform	7	-
	Total	**44**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	H Hsu , R Ranjan	ALS & SYSTEMS 2nd Edition
2	Parthasarathy	s and Systems, 2ND Edition

3	C.L. Philips, J.M.Parr	signals, Systems and Transforms 3ed., 2004, PE.
Electronics materials, Web Site, etc: www.nptel.ac.in, www.tutorialspoint.com		

Course Details

Course Title	Electronics Circuit					
Course Code	**EC-2324**					
Category	Professional Core Course					
Scheme and Credit	L	T	P	C	Semester IV	
	3	0	2	4		
Pre-requisites for this course (if any):	**1.knowledge Semiconductor Devices** **2. Knowledge theorms**					
The Course objectives are to	• knowledge of the basic principles of electronic circuits operation, • calculation and measurement of parameters for electronic circuits, • designing electronic circuits, • performance analysis of electronic circuits.					

Course Outcomes: After completing this course students are able to:

CO1	Explain the theoretical principles essential for understanding the operation of electronic circuits,	Understand
CO2	Measure the characteristics of electronic circuits and present experimental results	Analyze
CO3	Analyze electrical circuits and calculate the main parameters	Analyze
CO4	Develop, design and create simple analogue and digital electronic circuits	Analyze
CO5	Choose an engineering approach to solving problems, starting from the acquired knowledge essential for the design of electronic circuits	Analyze

Detail Contents

Module	Contents	L	T
I	**Bipolar Junction Transistors:** Introduction to Transistor Transistor a amplifier biasing the BJT for discrete-circuit design, small signal Equiv circuits and Analysis of transistor parameters using H and r_e model.Int	12	

	capacitance of transistorIntroduction to FET, S and MOSFETs MOSFET Circuit at DC, MOSFET as an Amplifier,Internal capacita MOSFETS		
II	**Frequency Response:** S-domain analysis,Amplifier transfer circuit, Low and High Frequency response of BJT amplifier: General Frequency consideration, low Frequency Analysis: Bode plot	7	
III	**Large Signal Amplifier**: Analysis and design of Class A, B, AB, C Amplifier**,**Push pull amplifier,Transformer less output stage, Distortion Calculation.	7	
VI	**Multi Stage Amplifier:** General CascadeSystem, RC coupled amplifier and its frequency response' Merits and Demerits,Cascade and cascode Amplifier, Darlington amplifier, Multi stage frequency effect.	7	
V	**General feedback structure**, properties of negative feedback four basi feedback topologies series shunt; series-series; shunt-shunt; & shunt- feedback amplifier determination of Loop gain stability problem, Basic, principles of sinusoidal oscillator, RC oscillators,Wein bridge and phas shift oscillator Colpitts oscillators, Hartley and Clap tuned oscillators Crystal Oscillators.	7	
	Total	40	

Suggested Book

S.No.	Author	Title
1	R Boylestad	Electronics Devices and circuit
2	Millman and Halkias	Integrated Devices and Circuit
3	A. S. Sendra& K.C Smith	Microelectronics Circuit
4	Study Link	https://www.youtube.com/watch?v=g7vYop_46tU&list=PL1wb6bQScw1lIti7lMZP5tPXZzyq6moM_

THEORYSEMESTER–4

Course Title	**Microprocessor and Applications**				
Course code	**EC-2325**				
Scheme and Credits	L	T	P	C	Semester I**V**
	3	1	0	4	
Pre-requisites(if any)	**To understand the microprocessor concept. First you need to learn the concepts of computer organization. computer organization and computer architecture are the pre requisites for understanding the operation of microprocessor..**				
Course Objectives	**1. Introduction: CPU, Register, memory, Buses, Memory addressing capacity of a CPU.** **2. CPU Architecture, Pin configuration, Instructions, Addressing modes, Instruction word size, Languages.** **3. Timing Diagram: Read cycle, write cycle, fetch cycle, Memory read, Memory write, I/O cycle.** **4. Programming: Simple programming: 8-bit addition &subtraction, 16-bit addition, Delay subroutine using register, finding lowest & highest no. in data array.** **5. Data transfer schemes, I/O port.** **6. 8255, 8251, 8253, 8257chips, pin diagram, control word, operating modes.** **7. Interfacing to ADC, Analog multiplexer, simple & hold.**				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Understand the basic architecture of 8085 and 8086.				Understanding
CO2	Impart the knowledge about the instruction set..				Understanding
CO3	Understand the basic idea about the data transfer schemes and its applications				Understanding
CO4	Develop skill in simple program writing for INTEL 8085 and INTEL 8086				Understanding

CO5	Understand the Instruction Sets of 8086, Simple Programming to 8086: Largest no. in a data array, Smallest no. in data array	Understanding

Detailed Contents : EC-2325			
Modules	**Contents**	**L (Hrs)**	**T (Hrs)**
I	Introduction to Microprocessors: Evolution of Microprocessors, Timing and control, 8-bit Microprocessor (8085): Architecture, Instruction set, Addressing modes, Interrupts, Assembly Language Programming.	12	3
II	16-bit Microprocessors (8086/8088): Architecture, Physical address, segmentation, memory organization, Bus cycle, Addressing modes, difference between 8086 and 8088, Introduction to 80186 and 80286, Introduction to Instruction set of 8086.	7	2

III	Data Transfer Schemes: Introduction, Types of transmission, 8257 (DMA), 8255 (PP), Serial Data transfer (USART 8251), Keyboard-display controller (8279), Programmable Priority Controller (8259)	5	1
IV	Programmable Interval Timer/ Counter (8253/8254): Introduction, modes, Interfacing of 8253, applications. ADC / DAC: Introduction, DAC and ADC methods, ADC IC (0808/0809), DAC and ADC Interfacing and Applications.	8	2
V	Advanced Microprocessors: Introduction to 32-bit and 64-bit microprocessors, PowerPC,	8	2
	Total	**40**	**10**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	New Age International Publishers, 2nd Edition. Penram Publication	Text Books 1. R. Singh and B. P. Singh: Microprocessor Interfacing and Application,

THEORY SEMESTER-IV

Course Title	Programming in C ++ & Data Structure				
Course code	**EC-2326**				
Scheme and Credits	L	T	P	C	Semester IV
	3	1	0	3	
Pre-requisites(if any)	**Knowledge of basic programming**				
Course Objectives	• Understanding object oriented programming concept. • Understanding set of rules and procedures to design algorithm. • Understanding to arrange the data using data structure • Applying to create real time application				

Course Outcomes On the successful completion of the course, students will be able to:

CO 1	Able to understand Object Oriented Programming Concept likes Object, Class, Overloading, Overriding, Encapsulation, Inheritance, Access Specfier, Virtual function	Understanding
CO 2	Able to understand Loop, Switch, Pointer, Condition, Operator	Understanding
CO 3	Able to understand basic purpose of data structure, understand to implement the algorithm using queue, stack, array	Understanding
CO 4	Able to understand link list use in algorthim design	Understanding
CO 5	Able to understand different sorting and searching mechanism	Understanding

Detailed Contents Programming in C ++ & Data Structure EC-2326

Modules	**Contents**	**L(Hours)**	**T (Hours)**
I	Basic stricture of a C++ program, Types and Declarations: Types - Boolean, ch integer, Floating point, enumerated. Conditional statements and loops. Decla structure, multiple names, scope, initialization. Function declaration, argument p value return. Recursive functions. Macros.	8	-

II	Classes objects, private, public and protected variables. Arrays (one and two dimensional). Pointers, new operator and delete operator for dynamic memory management. Pointer to arrays, constants, reference, pointer to void, pointer to function. Function overloading, operator overloading, friend function, derived class (inheritance), polymorphism, virtual function, templates, Files and streams. Library functions for File and String operations. Introduction to Standard Template Library. Programming tools- make files, debuggers, revision control systems, exception handling.	12	-
III	Stacks: Basic operation of stacks, array representation of stacks, application of stacks. Conversion of infix to prefix and postfix expressions, evaluation of postfix expression using stacks. Queues: Array and Linked representation and implementation of queues, basic operations on queues.	9	-
IV	Linked List: Representation and implementation of single and double linked lists, basic operations, traversing and searching of linked list. Trees: Binary tree, basic operation, binary search tree, binary tree traversal (inorder, preorder, postorder)..	8	-
V	Searching: Sequential search, binary search, comparison and analysis. Sorting: Insertion sort, selection sort, bubble sort, quick sort, shell sort, merge sort, heap sort. Comparison of Sorting Algorithms by Speed and Space.	7	-
	Total	**44**	-

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S. N.	AUTHOR	TITLE
1.	A. M. Tenenbaum	, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.
2.	K Loudon,	Mastering Algorithms With C", Shroff Publisher & Distributors Pvt. Ltd
3.	Bruno R Preiss	Data Structures and Algorithms with Object Oriented Design Pattern in C++", Jhon Wiley & Sons, Inc.
4.	Adam Drozdek,	Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia Pvt. Ltd.(Singapore)

Electronics materials, Web Site, etc: www.nptel.ac.in

Laboratory 4sem

Course Title	Electronics lab-II				
Course Code	**20321**				
Scheme and Credit	L	T	P	C	Semester III
	0	0	2	1	
Pre-requisites for this course (if any):	**1.knowledge of semiconductor Devices** **2. Knowledge basic component**				
Course Objective	1. The lab course will give a practical exposure to students to learn the characteristics of Devices and there circuits. 2. To gain the practical hands on experience by exposing student to various Semiconductor Devices .				

Course Outcomes: on completion of this lab course student will be able to:

CO1	Able to calculate different parameters of BJTs, FETs, MOSFETs and Oscillator circuit	Understand
CO2	Able to design and analyze different BJTs, FETs, MOSFETs circuits	Analyze& Design
CO3	Able to understand different power amplifier circuits.	Understand
CO4	Able to analyze cascade, cascode, feedback and oscillator circuits	Understand
CO5	Demonstrate various characteristics of, BJT's and FET's, MOSFET, and oscillators	Demonstrate

List of Experiments: (At least 8 experiments should be conducted from the list of experiments.)

1	Biasing of NPN **and PNP transistor in CE transistor.**
2	Biasing of FET
3	MOSFET as a amplifier.
4	Study of single stage RC-couple BJT amplifier(Frequency response, Max signal handling capacity, input impedance.
5	Study of single stage RC-couple FET amplifier(Frequency response, Max signal handling capacity, input impedance
6	Study of class AB/B, push-pull amplifier
7	Study of Cascode amplifier
8	To realize emitter follower amplifier using Darlingtion pairs transistor and find the input impedance.
9	Study of tuned amplifier and construction of oscillators.
10	Realization of fixed frequency Wein-bridge oscillator
11	Study of crystal oscillator.
12	Study of feed-back circuit using transistor and OP-AMPs.
13	Study of H- parameters of BJTs.

Laboratory 4sem

Course Title	Electronics workshop & PCB Lab				
Course Code	**20322**				
Scheme and Credit	L	T	P	C	Semester IV
	0	0	2	1	
Pre-requisites for this course (if any):	**1.knowledge of semiconductor Devices** **2. Knowledge basic component**				
Course Objective	1. The lab course will give a practical exposure to students to learn the basic of PCB Design. 2. To gain the practical hands on experience of circuit designing .				

Course Outcomes: on completion of this lab course student will be able to:

CO1	Able to understand different types of Equipment & Chemicals	Understand
CO2	Able to anlyze different electronic circuits	Analyze
CO3	Able to understand the PCB designing process.	Understand
CO4	Able to understand the construction process of PCB design	Understand
CO5	Demonstrate various PCBs	Demonstrate

List of Experiments:

1	Study of Equipments and Chemicals
2	Study of CRO, DMM & Function Generator
3	Identification of Active & Passive Components
4	Winding shop: Step down transformer winding of less than SVA
5	Soldering shop: Fabrication of DC regulated power supply
6	PCB Lab: (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB
7	Wiring & fitting shop; Fitting of power supply along with a meter in cabinet
8	Testing of regulated power supply fabricated.

LABORATORYSEMESTER-IV

Course Title	MICROPROCESSOR LAB				
Course code	**EC**-20325				
Scheme and Credits	L	T	P	C	Semester 4th
		0	2	1	
Pre-requisites(if any)	**C programming. Basic Unix command line tools. Basic structure of a processor-instructions, registers, and memory.**				
Course Objectives	•To study programming based on 8086 microprocessor and 8051 microcontroller. • To study 8086 microprocessor based ALP using arithmetic, logical and shift operations. • To study modular and Dos/Bios programming using 8086 microprocessor. • To study to interface 8086 with I/O and other devices. • To study parallel and serial communication using 8051 micro controller				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Demonstrate ability to handle arithmetic operations using assembly language programming in TASM and training boards				Understanding
CO2	Demonstrate ability to handle logical operations using assembly language programming in TASM				Analyzing
CO3	Demonstrate ability to handle string instructions using assembly language programming in TASM				Analyzing
CO4	Demonstrate ability to handle sorting operations and using assembly language programming in TASM				Analyzing
CO5	Able to understand and demonstration of Programming using arithmetic, logical and bit manipulation instructions				Understanding

MICROPROCESSOR LAB - EC-20325

Sno.	Contents
1	Signed Multiplication using Booth's Algorithm.
2	Recursive routine for finding Factorial N.
3	Look up table method for finding the ASCII of an alphanumeric code.
4	Interfacing with 8255 in 1/O mode/BSR mode.
5	Interfacing with 8253.
6	Verification of Interrupts.
7	Interfacing with ADC/DAC.
8	Mini Project on some interfacing applications.
9	Serial communication between two kits through RS-232C using 8251.

LABORATORY SEMESTER-IV

Course Title	Data Structure Lab				
Course code	**EC-20324**				
Scheme and Credits	L	T	P	C	Semester iv
		0	2	1	
Pre-requisites(if any)	**1. Knowledge of basic computer .** **2. Knowledge of c language.**				
Course Objectives	• Understanding object oriented programming concept. • Understanding set of rules and procedures to design algorithm. • Understanding to arrange the data using data structure Applying to create real time application				

Course Outcomes

On the successful completion of the course, students will be able to:

CO1	Define various problems and apply algorithmic methods for successful solutions.	Understanding
CO2	Demonstrate the commonly used applications and representations of arrays, linked lists,stacks, queues and trees.	Analyzing
CO3	Apply various algorithms to solve the problems of searching and manipulation of data.	Analyzing
CO4	Examine the use of fundamental data structures and algorithm appropriately to solve anumber of computational problems.	Analyzing
CO5	Illustration of Object , class polymorphism, encapsulation, constructor ,inheritance, access specifier	Analyzing

Data Structure Lab EC- 20324

Sno.	Contents
1	To implement the concept of function with default arguments
2	To write a C++ program to find the value of a number raised to its power using call by value.
3	To write a program in C++ to implement the concept of call by reference.
4	To write C++ program to implement single inheritance function.
5	To write C++ program to implement constructor destructorfunction.
6	To write C++ program to implement Single Inheritance, Multilevel Inheritance function.
7	To write C++ program to implement function overloading function.
8	To write C++ program to implement Queue function
9	To write C++ program to implement stack function.
10	To write C++ program to implement bubble sort function.
11	To write C++ program to implement selection sort function.
12	To write C++ program to implement insertion sort function.
13	To write C++ program to implement binary search function.
14	To write C++ program to implement array function.

THEORY SEMESTER – 5

Course Title	**Microcontroller and Embedded System**				
Course code	**EC-3314**				
Scheme and Credits	L	T	P	C	Semester **V**
	3	1	0	4	
Pre-requisites (if any)	**Basics of Digital Electronics**				
Course Objectives	1. To study different types of Microcontroller and its pin diagram. 2. To study assembly language programming of 8051.. 3. To study the different types of Interrupts & Programming the 8051 timers. 4. To discuss about Interfacing with 8051. 5. To study about the Introduction to Embedded Systems.				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Know the different types of Microcontroller and its pin diagram. Intel 8096 and MC68HC11microcontroller.wave dipole.				Understanding
CO2	Know assembly language programming of 8051 its register banks and stack, 8051 10 programming, 10 bit manipulation programming				Understanding
CO3	study the different types of Interrupts & Programming the 8051 timers. programming external hardware interrupts, programming the Serial communication interrupts, Interrupts priority in the 8051				Understanding
CO4	Know the working principle and construction Interfacing with 8051. ADC, DAC interfacing. Sensor interfacing and Signal Conditioning. Stepper motor and DC motor				Understanding

CO5	Know about the Introduction to Embedded Systems. Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits	Understanding

Detailed Contents : Antenna & Wave Propagation EC - 3314			
Modules	**Contents**	**L (Hrs)**	**T (Hrs)**
I	Introduction to Microcontrollers, Evolution, Microprocessors Vs Microcontrollers, MCS-51 Family Overview, Important features, Architecture. 8051 Pin Functions, Architecture, Addressing Modes, Instruction Set, Instruction Types. Introduction to Intel 8096 and MC68HC11microcontroller.wave dipole.	12	3
II	Programming :Introduction to 8051 assembly language programming. The program counter and ROM space in the 8051,8051 data types and directives, 8051 flag bits and the PSW register,8051 register banks and stack, 8051 10 programming, 10 bit manipulation programming	7	2
III	Interrupts Programming the 8051 timers, Counter programming. Basics of serial communications,8051 connection to RS-232, 8051 serial port programming assembly, 8051 interrupts, Programming timer interrupts, programming external hardware interrupts, programming the Serial communication interrupts, Interrupts priority in the 8051	5	1

IV	Interfacing with 8051: Memory address decoding 8031/ 51 interfacing with external ROM, 8051 data memory space, LCD, Keyboard, Parallel and Serial ADC, DAC interfacing. Sensor interfacing and Signal Conditioning. Stepper motor and DC motor	8	2
V	Introduction to Embedded Systems Background and History of Embedded Systems, Definition and Classification, Programming languages for embedded systems: desirable characteristics of programming languages for embedded systems, Low-level versus high-level languages, Main language implementation issues; control typing. Major programming languages for embedded systems. Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits Introduction to real time embedded systems with its components and examples.	8	2
	Total	**40**	**10**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	Ayala Kenneth	The 8051 Microcontroller, Cengage Learning, 5th Edition,208
2	Shah Satish	8051 Microcontrollers MCS 51 Family and its variants", Oxford,4th ED 2017
3	Ghoshal Subrata	Microcontroller Internals Instructions. andInterfacing Pearson,5th Ed 2018

Electronics materials, Web Site, etc: www.nptel.ac.in

THEORY SEMESTER-5

Course Title	**Analog Integrated Circuit**				
Course code	Course Code-3312				
Scheme and Credits	L	T	P	C	Semester v
	3	0	0	3	
Pre-requisites(if any)	**Knowledge of Different types of Electronic Analog circuits.**				
Course Objectives	● To have an adequate knowledge in the measurement techniques ● For power and energy, power and introduce the meters used to measure current & voltage.				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Analyze the static and dynamic electrical behavior of CMOS circuits.				**Realization**
CO2	Analyze and design active filters usign op -amp & IC Voltage regulators.				**Realization**
CO3	Design circuits for different applications using IC 555 Timer and analyze the PLL & VCO ICs for different applications.				**Analyzed, Evaluated**
CO4	To analyse high frequency and noise characteristics of amplifiers				**Realization**
CO5	To analyse about feedback circuits and about Op-Amp performance characteristics				**Realization**

Detailed Contents Analog Integrated Circuit-EC-3312

Modules	Contents	L(Hours)	T (Hours)
I	**IC OP-AMP applications:** OP-AMP Fundamentals (brief review of differential amplifier, current mirror, active load, level shifter, output stage; ac and dc characteristics) Basic building blocks using OP-AMPS. Inverting/Non-inverting VCVS, Integrators, Differentiators, CCVS and VCCS, Instrumentation Amplifiers.	8	-
II	**Waveform Generator:** Square wave generators: 555Timer, Crystal controlled Oscillator Ramp Generator: Triangle generator, Sawtooth generator Sine wave generator: Requirement for sinusoidal oscillations, Wien-bridge and twin-T oscillators. Function Generators: Multi op-amp function generators, IC function generators Digitally controlled frequency synthesizer: PLL Fundamentals, PLL synthesizer, Totally digital synthesizer.	12	-
III	**Active Filters:** Introduction to filtering: Frequency response, Characteristics and terminology, Active versus passive filters Low pass filter: First order low pass active filter, second order active filter model, second order low pass filter characteristics, Sallen-Key unity gain filter, Sallen-Key equal component filter, Higher order filters. High pass active filter. Band pass filter: single op-amp band pass filter, multistage band pass filter State variable filter	10	-
IV	**Non-linear Circuits:** Logarithmic Amplifiers, Log/Antilog Modules, Precision Rectifier, Peak Detector, Sample and Hold Circuits. OP-AMP as Comparator, Schmitt Trigger, Square and Triangular Wave Generator, Monostable Multivibrator. IC Analog Multiplier applications OTA	10	-
V	**Voltage Regulators:** OP-AMP Regulators, IC Regulators, Fixed Voltage Regulators (78/79, XX), SMPS.	7	-
	Total	**47**	-

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	han Carusone	Integrated Circuit Design, 2nd Edition,
2	**asivam**	lecommunication Switching and Networks. By
3	C.L. Philips, J.M.Parr	signals, Systems and Transforms 3ed., 2004, PE.

Electronics materials, Web Site, etc:www.tutorialspoint.comwww.nptel.ac.in

https://xdevs.com/doc/_Books/ASIC_Design/analog%20integrated%20circuits%20design%20%28johns%2Cmartin-1997%29.pdf

THEORY SEMESTER-5

Course Title	Principle of communication				
Course code	**EC-3313**				
Scheme and Credits	L	T	P	C	Semester v
	3	0	0	3	
Pre-requisites(if any)	**1. Knowledge of basic electronics.** **2. Knowledge of signal and system.**				
Course Objectives	• To become familiar with fundamental of analog communication systems. • To analyze various analog modulation and demodulation techniques. • Familiar with transmitters and receivers. • To know the effect of noise on the performance of amplitude modulation, frequency modulation and phase modulation.				

Course Outcomes

On the successful completion of the course, students will be able to:

CO1	Able to learn the fundamentals of Analog communication systems.	Understanding
CO2	Able to understand different analog modulation techniques like Amplitude modulation, Frequency modulation, Phase modulation and Pulse modulation	Understanding
CO4	Able to analyze the characteristics of transmitters and receivers.	analyze
CO5	Able to understand the effect of noise on communication systems.	Understanding

Detailed Contents - Principle of communication EC-3313			
Modules	**Contents**	**L(Hours)**	**T (Hours)**
I	**Introduction**: Communication Process, Source of information, Communication Channels, ba and pass band signals , representation of signal and systems, the modulation process, communication resources, analog versus digital communications.	8	-
II	**Amplitude Modulation**: Frequency division and time division multiplexing, suppressed carrier system, single side band transmission, amplitude modulation with carrier power, effect of frequency and phase errors in synchronous detection, comparison of various AM systems, vestigial sideband transmission	12	-
III	**Angle Modulation:** Narrow and wideband FM, multiple frequency and square wave modulation, linear and non linear modulation, phase modulation, Demodulation of FM signals, Noise Reduction Pulse Modulation: Pulse Amplitude Modulation, other forms of pulse modulation, bandwidth required for transmission PAM signals, comparison of frequency division and time division multiplexed systems.	12	-
IV	**Noise**: Different types of noise, Noise calculations, equivalent noise bandwidth, noise figure, effective noise temperature, noise figure in cascaded stages.	5	-
V	**Introduction to Information transmission**: Measure of Information, Channel Capacity, transmission of continuous signals exchange of bandwidth for signal to noise ratio, efficiency of PCM systems.	5	-
	Total	**42**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	R.P. Singh, SP Sapre	Communication Systems TMH, 3rd edition 2017
2	Lathi B.P	Analog and Digital Communication systems Oxford Press, 4/E edition 2011
3	Haykin Simon	Communication Systems, 4/E John Willey & Sons, 2006.
4	Taub & Schilling	Principles of communication systems, 4/E McGraw Hill, 2017

Electronics materials, Web Site, etc: www.tutorialspoint.com ,www.nptel.ac.in

THEORY SEMESTER – 5

Course Title	**Antenna & Wave Propagation**				
Course code	**EC-3314**				
Scheme and Credits	L	T	P	C	Semester **V**
	3	1	0	4	
Pre-requisites (if any)	**EM Waves & Transmission Lines**				
Course Objectives	1. To study different terminologies of an antenna, radiation fields of dipole antenna. 2. To study types of antenna array, Radiation pattern of two element array and n – element array. 3. To measure different parameters of an antenna. 4. To discuss various practical antennas. 5. To study propagation of waves, mode of propagation.				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Know different terminologies of an antenna, radiation fields of a current element and half wave dipole antenna.				Understanding
CO2	Know types of antenna array, radiation pattern of two element array and n – element array and also, principle of pattern multiplication.				Understanding
CO3	Measure different parameters of an antenna, e.g., radiation pattern, gain, efficiency, phase, current distribution.				Understanding
CO4	Know the working principle and construction of VLF, LF, HF, VHF , UHF, Microwave , frequency independent antennas and also, their applications.				Understanding
CO5	Know about mode of wave propagation, different terminologies used in wave propagation.				Understanding

Detailed Contents : Antenna & Wave Propagation EC - 3314			
Modules	**Contents**	**L (Hrs)**	**T (Hrs)**
I	Introduction to antenna structure, isotropic radiator, Basic terminologies: radiation pattern, radiation intensity, gain of antenna, Directivity, Antenna Efficiency, Effective Aperture, Effective length, Antenna impedances, FBR, Beam width, Bandwidth, Antenna Polarization, Reciprocity Theorem, Mode of Exciting an antenna, Antenna temperature, Radiation resistance. Electromagnetic Radiation, Short Electric dipole, Retarded vector potential, Radiation fields of a current element, Power radiated by current element, Radiation fields from Monopole & Half Wave Dipole, power radiated by half wave dipole.	12	3
II	Uniform linear array, Types of antenna array, Arrays of two-point sources, Linear array with n isotropic point sources: Broad side and End fire case, Principle of pattern multiplication and its application. Binomial array.	7	2
III	Radiation Pattern measurement, Uniform distance requirement , uniform amplitude requirement, Introduction to phase measurement; Gain Measurement, Introduction to current distribution measurement, Measurement of antenna efficiency, measurement of Noise figure and noise temperature of an antenna, polarization measurement.	5	1
IV	VLF and LF transmitting antennas (Hertz and Marconi), effect of antenna height and effect of ground on antenna performance, effect of antenna height. MF antennas : Tower radiator, HF antennas: Long wire antenna, Loop antenna: receiving antenna and radio direction finder, electric field of small loop antenna, Directivity of circular loop antenna with uniform current, VHF, UHF, SHF antennas: Folded dipole antennas, Yagi-Uda antenna, Helical antenna, Reflectors antenna, Horn Antenna, Microstrip antenna, Slot antenna, Turnstile antenna, Smart Antenna, Frequency independent concept, RUMSEY's Principle, Biconical antenna,	8	2

V	Introduction to radio waves, Fundamental equation for Free space propagation. Modes of Propagation, Structure of atmosphere, Characteristics of different ionized regions, Sky wave propagation: Expression for refractive index of ionosphere, Critical frequency, effect of earth's magnetic field, Virtual Height, MUF, LUF, OWF, Skip Distance. Space wave propagation: LOS distance, effective earth's radius, effect of earth's curvature on tropospheric propagation. Field Strength of space wave, Duct Propagation.	8	2
	Total	**40**	**10**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	Prasad, K.D./	"Antennas and Wave Propagation"/ Satya Publications
2	Kraus, John D. & Marhefka, Ronald J. /	"Antennas: For All Applications" / Tata McGraw Hill, 3rd Ed.
3	Jordan Edwards C. and Balmain Keith G./	"Electromagnetic Waves and Radiating Systems"/ Prentice Hall (India)

Electronics materials, Web Site, etc: www.nptel.ac.in

THEORY **SEMESTER-5**

Course Title	**Automatic Control System**				
Course code	**EE-3315**				
Scheme and Credits	L	T	P	C	Semester v
	3	1	0	4	
Pre-requisites(if any)	**Knowledge of laplace transform and mathematics**				
Course Objectives	In this course it is aimed to 1. Introduce the principles and applications of control systems in everyday life. 2. The basic concepts of block diagram reduction, transfer function representation, time response and time domain analysis, solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	A thorough knowledge on open loop and closed loop control systems, concept of feedback in control systems.				Understanding
CO2	Transfer function representation through block diagram algebra and signal flow graphs				Understanding
CO3	Time response analysis of different ordered systems through their characteristic equation.				Understanding
CO4	1. Time domain specifications, stability analysis of control systems in s-domain through R-H criteria.				Applying

CO5	Root locus techniques, frequency response analysis through Bode diagrams, Nyquist and state space analysis	Understanding

Detailed Contents **Automatic Control System** **EE-3315**			
Modules	**Contents**	**L(Hours)**	**T (Hours)**
I	**Introduction:** Concept of control system, Classification of control systems - Open loop and closed loop control systems, Differences, Examples of control systems- Effects of feedback, Feedback Characteristics. Transfer Function Representation: Block diagram algebra, Determining the Transfer f from Block Diagrams, Signal flow graphs(SFG) - Reduction using Mason's gain f Transfer function of SFG's	12	-
II	**Time Response Analysis:** Standard test signals, Time response of first order systems, Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications, Steady state response, Steady state errors and error constants.PID controllers: Effects of proportional derivative, proportional integral systems on steady state error.	8	-
III	**Stability Analysis in S-Domain:** The concept of stability – Routh-Hurwitz's stability criterion – qualitative stability and conditional stability – Limitations of Routh-Hurwitz's stability. **Root Locus Technique:** Concept of root locus - Construction of root locus	9	-
IV	**Frequency Response Analysis:** Introduction, Frequency domain specifications, Bode plot diagrams-Determination of Phase margin and Gain margin, Stability analysis from Bode plots, Polar plots.	8	-
V	**State Space Analysis of Continuous Systems:** Concepts of state, state variables and state model, Derivation of state models from block diagrams, Diagonalization, Solving the time invariant state equations, State Transition Matrix and it's properties, Concepts of Controllability and observability.	7	-

	Total	**44**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	U.A.Bakshi &V.U.Bakshi	Automatic Control Systems Technical Publication Pune 1.
2	A.K. Jairath	Solutions and Problems of Control Systems by, CBS Publishers
3	William Stallings	Data & Computer Communication, Prentice Hall-5th edition 2000.

Electronics materials, Web Site, etc: www.nptel.ac.in.,www.vtubooks.com

LABORATORYSEMESTER-V

Course Title	MICROCONTROLLER LAB				
Course code	**EC**-30326				
Scheme and Credits	L	T	P	C	Semester Vth
		0	2	1	
Pre-requisites(if any)	Basic microcontroller architecture, register details, peripherals, interrupts, memory etc. Good knowledge of c programming, knowledge of using development tool chain, cross compilation, binary file generation, JTAG based program load and debugging.				
Course Objectives	• To study programming based on 8086 microprocessor and 8051 microcontroller. • To study 8086 microprocessor based ALP using arithmetic, logical and shift operations. • To study modular and Dos/Bios programming using 8086 micro processor. • To study to interface 8086 with I/O and other devices. • To study parallel and serial communication using 8051 micro controller				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Demonstrate the skills in Assembly Language Programming of microprocessors and microcontroller.				Understanding
CO2	Interpret the basic knowledge of microprocessor interfacing, delay generation, and waveform generation.				Analyzing
CO3	Apply the concepts of Interfacing to connect external devices with the microprocessor 8085.				Analyzing
CO4	Apply the concepts of Interfacing to connect external devices with the microcontroller 8051.				Analyzing

CO5	Implement microcontroller based simple real time applications.	Understanding

MICROCONTROLLER LAB-30326

Sno.	Contents
1	Writea program of Flashing LED connected to port I of the Micro Controller
2	Write a program to show the use of INTO and INTI.
3	Write a program to generate 10 kHz square wave.
4	Write a program to generate 10 kHz frequency using interrupts.
5	Write a program for temperature & to display on intelligent LCD display
6	Write a program to demonstrate the polling of Interrupt of 805 1/8031 micro controllers.
7	Write a program to generate a Ramp waveform using DAC with micro controller.
8	Write a program to control a stepper motor in direction, speed and number of steps.
9	Writea program to control the speed of DC motor

LABORATORY SEMESTER-5

Course Title	Analog Integrated CircuitLab				
Course code	**EC-30317**				
Scheme and Credits	L	T	P	C	Semester v
		0	2	1	
Pre-requisites(if any)	**1. Knowledge of basic electronics.** **2. Knowledge of Analog circuit.**				
Course Objectives	• To become familiar with fundamental of analog integrated circuit. • To design and implement the circuits to gain knowledge on performance of the circuit and its application • To analyze various analog circuit PLL and Schmitt trigger. • Familiar with operational amplifier. To know the input impedance output impedance and voltage gain. Familiar with BJT,MOS,NMOS,PMOS.				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Able to learn the fundamentals of various Analog Integrated circuit.				Understanding
CO2	Design and analyze operational amplifier.				Analyzing
CO3	Design and analyze schmitt trigger.				Analyzing
CO4	Able to analyze the characteristics of operational amplifier.				Analyzing
CO5	Able to understand inverting amplifier and timer circuit.				Understanding

Analog Integrated Circuit Lab EC- 30317

Sno.	Contents
1	Measurement of Op-amp Parameters. (Open Loop Gain, Input offset Voltage, CMRR,,Slew rate)
2	Determination of Frequency response of Op-Amp.
3	Study of Precision Rectifier .
4	Measure the voutput voltage of Instrumentation Amplifier.
5	Verify the Open Loop operation of Op-amp -Comparators - Schmitt Trigger.
6	Verify the output of Astable & Monostable Operation Using 555.
7	Measure the output of IC Voltage Regulator.
8	Verify the frequency of Voltage Controlled Oscillator.
9	Study of Phase Locked Loop.
10	Measure the output voltage of Frequency Multiplier .

LABORATORY SEMESTER-5

Course Title	Communication Lab- 1				
Course code	**EC-30318**				
Scheme and Credits	L	T	P	C	Semester v
		0	2	1	
Pre-requisites(if any)	**1. Knowledge of basic electronics.** **2. Knowledge of signal and system.**				
Course Objectives	• To become familiar with fundamental of analog modulation systems. • To design and implement the circuits to gain knowledge on performance of the circuit and its application • To analyze various analog modulation and demodulation techniques. • Familiar with transmitters and receivers. • To know the effect of noise on the performance of amplitude modulation, frequency modulation and phase modulation.				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Able to learn the fundamentals of various Analog modulation systems				Understanding
CO2	Design and analyze Amplitude modulation and demodulation system				Analyzing
CO3	Design and analyze Frequency modulation &Phase modulation system				Analyzing
CO4	Able to analyze the characteristics of transmitters and receivers.				Analyzing
CO5	Able to understand and demonstration of active filters				Understanding

Communication lab -1 EC- 30318

Sno.	Contents
1	To study Amplitude modulation using transistor and determine depth of modulation.
2	To study envelope detector for demodulation of AM signal
3	To study Frequency modulation using reactance modulator.
4	Narrow band FM generation using Armstrong method.
5	Study of Foster seeley discriminator.
6	Generation of DSB-SC signal using balanced modulator
7	Generation of single side band signal
8	Study of phase lock loop and detection of FM signal using PLL
9	Study of super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
10	Study and demonstration of active filter (low pass, high pass and band pass)

THEORY EC-3316

Course Title	Microwave Engineering				
Course Code	**EC-3316**				
Category	**Professional Core Course**				
Scheme and Credits	L	T	P	C	Semester VI
	3	0	0	3	
Pre-requisites for this course (if any):	**1.knowledge of EMFT.** **2. Knowledge of Vector algebra**				
The Course objectives are to	• An understanding of microwave waveguides, passive & active devices, tubes and network analysis. • An ability to design microwave matching networks. • An ability to perform microwave measurements • An understanding of RADARs and its applications.				

Course Outcomes:
The student after undergoing this course will be able to:

CO1	Analyze the wave propagation in TE,TM and TEM modes, different types of waveguides	Analyze
CO2	Analyze typical microwave networks using impedance, admittance, transmission and scattering matrix representations. And able to Design microwave matching networks using L section, single and double stub and quarter wave transformer.	Analyze
CO3	Explain working of microwave passive circuits such as isolator, circulator, Directional couplers, attenuators etc.	Design
CO4	Demonstrate various perceive operating principal of basic passive and active microwave devices.	Demonstrate
CO5	Demonstrate various microwave bench setup for measuring various parameters.	Demonstrate

Detail Contents

Module	Contents	L	T
I	Rectangular waveguide, solution of wave equation in rectangular, Derivation of field equations & TM modes, degenerate and dominant mode, Power Transmission and Power loss Excitation waveguides, nonexistence of TEM mode in waveguides Introduction to circular Waveguides St and microstrip line, . Microwave cavity resonators rectangular and cylindrical cavities, Quality Excitation of Cavities	12	
II	**Unit – II** Waveguide couplings, bends and twists Transitions, Directional couplers, hybrid couplers, Mat load, Attenuators and phase shifters, E-plane, H-plane and Hybrid Tees, Hybrid ring, Waveguic discontinuities Windows Tuning screw, Irises and ews, Detectors, wave meters; Isolators and Circulators, tunable detector, slotted line carriage VSWR meter. Scattering Matrix	7	
III	Limitation of conventional active devices at Microwave frequency. Klystron, Reflex Klystron, Magnetron, TWT BWO: Their schematic, Principle of operation, performance characteristics a application.	7	
VI	PIN diode, Tunnel diode LSA diode varactor diode Gunn Devices, IMPATT and TRAPATT their principal of operation characteristics and applications	7	

V	General set up of a microwave test bench, Slotted line carriage, VSWR Measurement, Measure frequency, Wave length, Impedance, Attenuation, Low and high-power Radiation pattern meas	7	
	Total	40	

Suggested Book		
S.No.	Author	Title
1	D. M. Pozar;	Microwave Engineering

THEORY SEMESTER 6

Course Title	**Digital Communication**				
Course Code	**EC-3317**				
Scheme and Credits	L	T	P	C	Sem-VI
	3	0	0	3	
Pre-requisites for this course (if any):	**1.Knowledge of Modulation Techniques** **2. Knowledge of Random Variables**				
The Course objectives are to	• Impart knowledge of the basic of Digital Communication system. • Impart knowledge of the basics of digital schemes like TDM, PCM etc. • Performance analysis of Digital Modulation Schemes like ASK,PSK,FSK. • Calculation of Noise in Digital Modulation Techniques. • performance analysis of coding techniques.				

Course Outcomes

- On the successful completion of the course, students will be able to:

CO1	Understand the basic concept of Digital communication system and apply the concept to different probability density function. Also code the data through different coding Theorem.	Understand
CO2	Analyze the concept of the mathematics of sampling theorem and digital transmission of analog signals Implementation of different digital modulation techniques used in digital communication.	Analyze
CO3	Analyze the Digital modulation Techniques and its Types.	Analyze
CO4	Understand the concept of optimum reception of digital signals and calculate the probability of error.	Understand
CO5	Understand the concept of optimum reception of digital signals and calculate the probability of error.	Understand
CO6	Analyze various parameters like information rate, entropy and channel capacity. Compare the performance of various digital communication systems	Analyze

Department of Electronics & Communication Engineering, IET BU Jhansi

Detailed Contents Digital communication EC-3317

Modules	Contents	L(Hr)	T (Hrs)
I	Model of Digital Communication System, Probability Theory and Random Variables , Logarithmic Measure of Information ,Entropy and Information Rate ,Conditional Entropy and Redundancy, Source coding, Fixed and Variable Length Code Words,Source coding Theorem, Prefix Doing and Kraft Inequality, Shanon Fano and Huffmann Coding.	11	-
II	PCM coding ,DM,DPCM,ADCM,Data Transfer rate ,Line Coding, NRZ & RZ type signaling Format for Unipolar , Bipolar signaling, AMI & Manchester code Differential and their Spectra (No Derivation) Matched Filter Receiver ,Derivation of its Impulse Response and Peak pulse Signal to Noise Ratio, Correlation Detector Decision Threshold and Error Probability for Binary . Unipolar (ON-OFF) Signaling , ISI, Nyquist Criterion for zero ISI & Raised Cosine Filter .	13	-
III	Gram Schmidt orthogonalization Procedure, Types of Digital Modulation , Wave forms for Amplitude Shift Keying(ASK) , Frequency Shift Keying (FSK), Phase Shift Keying (PSK) , Differential PSK, Quadrature Modulation Techniques QAPSK or QAM , Probability of Error & Comparison of Various Digital Modulation Techniques .	9	-
IV	Fundamental of Time Division Multiplexing ,Electronic Commutator, Bit, Byte Interleaving T1 Carrier System , Synchronization and Signaling of T1,TDM,PCM Hierarchy, T1 to T4 PCM TDM System(DS1 to DS4 Signals).	10	-
V	Error free control over a Noise Channel, Hamming Code , Relation between Minimum Distance and Minimum distance Error Correcting Capability, Linear Block codes, Encoding and Syndrome Decoding , Cyclic codes , Encoder and Decoder for Cyclic codes , Convolution Codes, Tree diagram state diagram and Trellis Diagram , Viterbi and Sequential Decoding ,Comparison of Performance**.**	14	-
	Total	**57**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	Taub & Schiling	Principles of Communication Systems , 4th Edition, Tata Mc Graw Hill.2017
2	Simon Haykin	Communication System ,6th Edition, John Wiley & Sons, Inc.,5th Ed,2009
3	B.P.Lathi	Modern Digital and Analogue Communication Systems,5th Edition, Oxford University Press,2018

CourseTitle	VLSI Technology & Design				
Coursecode	**EC-3318**				
Category	Professional Core Course				
SchemeandCredits	L	T	P	Total	**3rd Year/6th Sem**
	3	0	2	5	
Pre-requisites(ifany)	**1.Knowledge of how convert sand to semiconductor** **2. Knowledge of MOS transistor, CMOS transistor and ICs**				
Course Objectives	• Impart knowledge of the transistors • Impart knowledge of the process of how to make electronic grade silicon • Impart knowledge of the MOS,CMOS etc. • performance analysis of circuits design using VHDL				

Course Outcomes

Onthesuccessfulcompletionofthecourse, studentswill beable to

CO1	Understand the theoretical aspect essential for understanding the material used in electronics devices acquired knowledge essential for the design of electronic circuits	Understanding
CO2	Understand to measure the characteristics of electronic circuits and present experimental results.	Understanding
CO3	student able to Understand use optical device in small projects like(Photo diode, LDR, Optical transistor etc.)	Understanding
CO4	**Create models of moderately sized CMOS circuits that realize specified digital functions**. choose an engineering approach to solving problems, starting from the	Applying
CO5	develop, design and create simple analogue and digital electronic circuits	Evaluating

Detailed Contents

Module	Contents	L (Hours)	T (Hours)
I	1 Era of Integrated Cireuit: Introduction to Monolithic Integrated Circuit Technology, Bipolar & MOS IC, Film 1C.	9	-
II	Crystal Growth and Wafer Preparation :Crystal Growth: Silicon wafer Preparation & characterization, Oxidation: Thermal oxidation, Oxide thickness measurement, Oxidation system. **Difusion of dopants:** Difusion Eqns. Dopant profiles, sheet resistance, diffusion furnace, liquid and gaseous dopants, **Ion Implantation:** Ion implantation techniques, dopant profiles, apparatus used, **Epxitaxy:** Epitaxial growth of Si, apparatus for epitaxy, Photolithography techniques for pattern transfer, Mask making, photo resist & Etching techniques.**Film Deposition:** Vacuum deposition & Sputtering apparatus, CVD Processes and its applications in IC Lab, metallization.	9	-
III	**MOS Transistor:** MOS Structure, MOS/IGFET Devices, MOS System under external bias, Structure& operation of MOSFET, Enhancement mode & Depletion mode devices, -Vi characteristics, MOSFET Scaling & Small-Geometry Effects.**CMOS Basic Circuits:** MOS Inverters, static & dynamic characteristics, NAND, NOR, AOI Circuits,Design Considerations, Layout Design, Micron & Submicron technologies, parasitic effects, Physicallimitations, Concepts of SPICE for Circuit simulation.	9	-
IV	**Standard Digital ICs:** Combinational and Sequential MOS Logic Circuits, Design of standard Cells for LSI, VLSI Circuits, Computer-Aided Design Technology, Semiconductor Memories: DRAM, SRAM, Flash	9	-
V	**Programmable Logic Devices:** PLA, PAL, PLD/CPLD, PGA/FPGA, ASIC, VLSI Testing.	9	-
	Total	**45**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes, PO: Program Outcomes,

PSO: Program Specific Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	S.M. Sze (Ed.)	VLSI Technology
2	by D.A. Pucknell & Eshraghian (PHI)	Basic VLSI Design
3	Pearson Pub References books	. Modern VLSI Design Systems on Silicon by Wayne Wolf
4	ED. John Willey/. S. Gandhi	/VLSI Fabrication Principles/2nd

THEORY SEMESTER-6

<table>
<tr><td>Course Title</td><td colspan="5">Electronic Switching</td></tr>
<tr><td>Course code</td><td colspan="5">Course Code-3332</td></tr>
<tr><td rowspan="2">Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>C</td><td rowspan="2">Semester vi</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Pre-requisites(if any)</td><td colspan="5">Knowledge of Different types of Telecommunication switching system.</td></tr>
<tr><td>Course Objectives</td><td colspan="5">● This course deals with the basics of telecommunication switching and systems
● It deals with introduction of telecommunication systems.
● Mainly aims with historical development. Also deals with the Telecommunication standards organizations</td></tr>
<tr><td colspan="6">Course Outcomes
On the successful completion of the course, students will be able to:</td></tr>
<tr><td>CO1</td><td colspan="3">Understands the Telephone networks,Subscriber loop systems, Switching hierarchy.</td><td colspan="2">Understanding</td></tr>
<tr><td>CO2</td><td colspan="3">Differentiate single stage and multistage networks</td><td colspan="2">Realization</td></tr>
<tr><td>CO3</td><td colspan="3">Design multi stage switching structures involving time and space switching stages.</td><td colspan="2">Analysis</td></tr>
<tr><td>CO4</td><td colspan="3">analyse performance of basic communication networks using both analytical and simulation techniques.</td><td colspan="2">Analysis</td></tr>
<tr><td>CO5</td><td colspan="3">Ability to apply the knowledge of reliability modeling to determine the downtimes of the subsystems.</td><td colspan="2">Evaluated</td></tr>
</table>

Detailed Contents Electronic Switching-EC-3332			
Modules	**Contents**	**L(Hours)**	**T (Hours)**
I	**INTRODUCTION:** Message switching, circuits switching, function of a switching systemFunction of a switching system translator senders,distribution framesCrossbar switch ,a general trunking,reedelectronic systems.	8	-
II	ng function, space division switching,multiple stage switching, multiple stage switching,non sblockingprobabilities,lee graphs and jacobeousfolded four wired switches,path findingswitch time division switching,a digital memory switch time stage in general, two dim ng,implementation, complexity of time signal STS switching,TST switching,TSSST switches, No. 4 E ssystem 75 digital PBX ,digital cross connect systems ,DCS hierarchy,cocolidation and segregation ,in nnet equipments,zeroloss switching	12	-
III	traffic load and parameters, Grade of service and blocking probabilitiesModeling switching systen birth death processincoming traffic and service time characteristicspoission arrival process, holding cking models and loss estimatesLost calls and cleared systems with infinite and finite subscribers ystems and lost call held systemdelay system and Erlang C formula	10	-
IV	Call processing function,sequence of operation ,signal exchanges, state transition diagrams control,reliability availability and securitystored program controlProcessor architecture centraliz distributed SPCLevel 3,level2 and level 1, SPC software system software , language process ,application software, Customer line signaling AF junctions and Trunk circuits, outband and signalling,PCM and inter register signallingcommon channel signalling, general princip networkCCITT singaling system no. 6 and no. 7, HDLC protocols	12	-
V	signal units ,the signaling information field,ATM service categories,ATM switchingPackets formats, statistical multiplexing,routing controlrouting control,memory space, memory-space-memory switch,Banyan network switchvirtual path circuit and fixed pah routing,ATM memory switch,space memory switch ,X.25 protocol,frame relay,TCP/IP, ATM cell.	7	-
	Total	**49**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	**AUTHOR**	**TITLE**
1	R. L. Freeman	Telecommunication Systems Engineering, , 4 Edition Wiley publication, 2010
2	**asivam**	lecommunication Switching and Networks. By
3	C.L. Philips, J.M.Parr	signals, Systems and Transforms 3ed., 2004, PE.

Electronics materials, Web Site, etc:www.nptel.ac.in,www.tutorialspoint.com

https://ccsuniversity.ac.in/bridgelibrary/pdf/EC_8th_Sem_Electronic%20Switching_P_Gnanasivam%20%20Telecommunication%20Switching%20and%20Networks_2nd-Edition-2008.pdf

CourseTitle	**INDUSTRIAL MANAGEMENT**				
Coursecode	HU-605				
Category					
SchemeandCredits	L	T	P	total	Semester VIth
	3	0	0	3	
Pre-requisites (if any)	None. To understand the basic management concepts and Industrial organization.				
Course Objectives	The objective of this course is to impart: -Achieving Maximum results with minimum efforts. -Increasing the Efficiency of factors of Production. -Maximum Prosperity for Employer & Employees. -Human betterment & Social Justice. -Obtain harmony in group action.				

Course Outcomes

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

CO1	Able to understand the concept and Importance of Industry	Understanding
CO2	Understand the roles, skills and functions of management etc.	Understanding
CO3	Helps in understanding the tools and techniques to be used in the performance of managerial job.	Understanding
CO4	To help the students to develop cognizance of the Importance of management principles	Understanding
CO5	Students shall be able to apply selected Industrial techniques for enhancing productivity in an organization	Applying

Detailed Contents			
Module	**Contents**	**L(Hours)**	**T (Hours)**
I	What is Operation Research? OR – Research Model, Solving the OR model, Queuing and simulation Models, Art of Modeling, Phase of OR study.	5	-
II	Introduction to Linear Programming: Two variable L-P Model, Graphical LP solution, Analysis of selected LP model	7	-
III	The Simplex Method LP solution space, Graphical to algebraic solution The Simplex Method, Artificial starting solution, Special case in simplex method application	4	-
IV	Transportation Model and its variants: Definition of Transportation model, Non-traditional Transportation model, Transportation Algorithms, Assignment model	6	-

V	Network Model: Network Definitions, Minimal Spanning Tree algorithms, CPM and PERT.	5	-
VI	Game Theory: Optimal Solution of two-person zero sum game, Solution of Mixed Strategy games. Introduction of patents and intellectual propriety right notes		
	Introduction to Engineering Management	5	
VII	Engineering and Management Historical Development of Engineering Management		
VII	Function of technology Management Planning and forecasting Decision Making Organizing Motivation and Leading Technical People Controlling	4	
VIII	Project Management Project Planning and Acquisition Project Organization, Leadership, and Control	4	
	Total	40	

Suggested Books

S.N.	AUTHOR	TITLE
1	Hamdy H Taha**,**	Operation Research-An introduction
2	Babcock & Morse	Management Engineering and Technology

PRACTICAL EC-30321

Course Title	Microwave Lab				
Course Code	**30321**				
Scheme and Credit	L	T	P	C	Semester VI
	0	0	2	1	
Pre-requisites for this course (if any):	**1. Knowledge of Microwave components.** **2. Knowledge solid state microwave Devices**				
Course Objective	1. The lab course will give a practical exposure to students to learn the characteristics of Microwave components. 1. To gain the practical hands on experience by exposing student to various microwave components.				

Course Outcomes: on completion of this lab course student will be able to:

CO1	Able to handle microwave component	Analyze
CO2	Able to understand microwave measurements	Analyze
CO3	Able to understand waveguide and antenna measurements	Design
CO4	Able to understand microwave test-bench setup.	Demonstrate
CO5	Demonstrate various microwave bench setup for measuring various parameters.	Demonstrate

List of Experiments: (At least 8 experiments should be conducted from the list of experiments.)

1	Characterization of E-Plane, H-Plane and Magic(Hybrid) Tee
2	Characterization of microwave Isolator and Circulator
3	Characterization of Microwave directional couplers
4	Characterization of Microwave attenuators
5	Characterization of Microwave phase shifters
6	Design of Wilkinson power divider
7	VI Characteristics of GUNN Diode
8	Study of PIN diode as a microwave switch
9	Operating modes of Klystron microwave source
10	Microwave measurements using a Vector Network Analyzer a. Return loss b. Insertion Loss c. Bandwidth d. Smith Chart

LABORATORY SEMESTER-6

Course Title	Communication Lab- II				
Course code	**EC-30322**				
Scheme and Credits	L	T	P	C	Semester VI
	-	0	2	1	
Pre-requisites(if any)	**1.Knowledge of Modulation Techniques** **2. Knowledge of Random Variables**				
Course Objectives	• Impart knowledge of the basic of Digital Communication system. • Impart knowledge of the basics of digital schemes like TDM, PCM etc. • Performance analysis of Digital Modulation Schemes like ASK,PSK,FSK. • Calculation of Noise in Digital Modulation Techniques. performance analysis of coding techniques				

Course Outcomes

On the successful completion of the course, students will be able to:

CO1	Understand the basic concept of Digital Communication system and apply the concept to different probability density function. Also code the data through different coding Theorem.	Understand
CO2	Analyze the concept of the mathematics of sampling theorem and digital transmission of analog signals Implementation of different digital modulation techniques used in digital communication.	Analyze
CO3	Analyze the Digital modulation Techniques and its Types.	Analyze
CO4	Understand the concept of optimum reception of digital signals and calculate the probability of error.	Understand
CO5	Understand the concept of optimum reception of digital signals and calculate the probability of error.	Understand

Communication lab -II EC- 30322

Sno.	Contents
1	Study of delta modulation and demodulation and observe effect of slope overload DCL-07.
2	Study of pulse data coding techniques for NRZ formats.
3	Data decoding techniques for NRZ formats. ST 2106-7
4	Study of amplitude shift keying modulator and demodulator.
5	Study of frequency shift keying modulator and demodulator.
6	Study of phase shift keying modulator and demodulator ST-467 7. Study of single bit error detection and correction using Hamming code. ST-2103.
7	Study of Pulse code modulation and demodulation.
8	Study of Adaptive delta modulation and demodulation

LABORATORY SEMESTER-6

Course Title	ELECTRONICS CAD LAB				
Course code	**EC**-30323				
Scheme and Credits	L	T	P	C	Semester 6th
		0	2	1	
Pre-requisites(if any)	**1. Knowledge of Design and Verify logic of all basic gates using Switch and LED.** **2. Design all Sequential circuits logic.** **3. Design all Combinations circuits Logic.** **4. ALU Design.** **5. Decoder and UART design.**				
Course Objectives	1. Apply the concepts of basic combinational logic circuits, sequential circuit elements, and programmable logic in the laboratory setting. 2. To develop familiarity and confidence with designing, building and testing digital circuits, including the use of CAD tools. 3. Behavioral, register- transfer, logic, and physical-level structured VLSI design using CAD tools and hardware description languages				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Able to learn the fundamentals of various circuits simulator.				Understanding
CO2	Design and analyze logic gates				Analyzing
CO3	Design and analyze layout of NMOS and CMOS Inverter				Analyzing
CO4	Able to analyze the Full adder using HDL				Analyzing
CO5	Able to understand Chip design using VHDL				Understanding

ELECTRONICS CAD LAB EC- 30323

Sno.	Contents
1	1. Design, Simulation and Analysis of following circuits using Circuit simulator: a Pushpull Amplifier. b. Differantial Amplifier c. NMOS and CMOS inverter d Two input NAND Gate e Two input NOR Gate
2	2. Layout Design of NMOS and CMOS Inverter using Layout Generator
3	3. Layout Design of Two Input NAND Gate
4	4. Simulation of Full Adder using HDL
5	5. Chip Design using VHDL (Mini Project).

THEORY SEMESTER-7

Course Title	Entrepreneurship Development				
Course code	**HU-4311**				
Scheme and Credits	L	T	P	C	Semester VIIth
	3	0	0	3	
Pre-requisites(if any)	Create awareness about Entrepreneurship among students and focuses on motivating students for Entrepreneurship.				
Course Objectives	The objective of this course are to -Introduce various qualities required for Entrepreneurship -Explain various Entrepreneurship models -Organize interaction with successful entrepreneurs -Introduce various tools and techniques like five S				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Identify and understand the qualities of entrepreneurs				Understanding
CO2	Understand the various entrepreneurship models				Understanding
CO3	Understand various schemes supporting entrepreneurship				Understanding
CO4	To help the students to develop the qualities to think Creative and Innovative				Applying
CO5	Demonstrate the ability to directing, leadership and communicate effectively				Evaluating

Modules	Contents	L(Hours)	T (Hours)
I	**Entrepreneurship-**definition, growth of small scale Industries,in developing countries and their positions vis-à-vis large industries, role small scale industries in the national economy, characteristics and types of small scale industries, demand based and resource based ancilliaries and sub control types. Government policy for small scale industry,stages in starting a small scale industry	10	-
II	Project Identification-assessment of viability, formulation evaluation, financing, field study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods	7	-
III	**Accountancy-**preparation of balance sheets and assessment of economic viability, decision making, expected cost, planning and production control, quality control, marketing industrial relation, sales and purchases,advertisement ,wages and incentives, inventory control, preparation of financial reports,accounta and store studies	7	-
IV	Project planning and control- The financial function,cost of capital approach in project planning, and control economic evaluation, risk analysis, capital expenditures, policies and practices of public enterprises, profit planning and programming, planning cash flow, capital expenditures and operations, control of financial flows, control and communication	8	-
V	Laws concerning entrepreneur viz. partnership laws, business ownership, sales and income taxes, works man compensation act.	10	-
	Total	**42**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	Dr. Gupta & Dr. Srinivasan	Entrepreneurship Development in India
2	R.K.Singal,Shruti singal	Entrepreneurship Development programme
3	T.N.Chhabra	Entrepreneurship Development

CourseTitle	**Digital Signal Processing**				
Coursecode	**EC-4312**				
Category	Professional Core Course				
SchemeandCredits	L	T	P	Total	Semester7th
	3	0	2	5	
Pre-requisites(ifany)	**1.Knowledge of understand about DSP and what is DFT and its uses** **2. Knowledge of different types of filters like analog and digital filters and design the filters.**				
Course Objectives	• Impart knowledge of Analog to digital converter • Impart knowledge of the discrete fourier transform • Impart knowledge of the Realization of FIR and IIR filters • performance analysis and design of filters like butterworth, Chebyshev etc.				

Course Outcomes

Onthesuccessfulcompletionofthecourse, studentswill beable to

CO1	Understand the theoretical aspect essential for understanding the digital signal processing	Understanding
CO2	Understand the analytical tools such as Fourier transforms, Discrete Fourier transforms, Fast Fourier Transforms and Z-Transforms required for digital signal processing.	Understanding
CO3	Student able to Understand Get familiarized with various structures of IIR and FIR systems.	Understanding
CO4	Design and realize various digital filters for digital signal processing.	Applying
CO5	The applications of DSP in speech processing and spectrum analysis.	Evaluating

Detailed Contents

Module	Contents	L (Hours)	T (Hours)
I	Discrete Fourier Transform: Frequency Domain Sampling: The Discrete Fourier Transform Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals. The Discrete Fourier Transform (DFT). The DFT as a linear Transformation. Relationship of the DFT to Other Transforms. Properties of the DFT. Periodicity, Linearity, and Symmetry Properties. Multiplication of two DFTs and Circular Convolution. Additional DFT Properties. Frequency analysis of signals using the DFT.	9	-
II	Efficient Computation of DFT Efficient Computation of the DFT: FFT Algorithms, Direct Computation of the DFT, Radix-2 FFT| algorithms. Efficient computation of the DFT of two real sequences, computations, Efficient computation of the DFT of a 2NPoint real sequences, Gortezel Algorithm, Chirp Z-transform algorithm.	9	-
III	Basie IIR Filter Structures: Direct forms (I & I), cascade and parallel realizations. Signal flow graph, Transposed structure, Basic FIR filter structures-. Direct form structure, frequency sampling structure, Lattice structure, Linear phase FIR structure. FIR structures.	9	-
IV	Symmetric and Anti-symmetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency Sampling Method, Design of FIR, Equiripple filter design Differentiators. Design of Hilbert Transformers.	9	-
V	Design of IR Filters From Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance. IIR Filter Design by the Bilinear Transformation. The Matched-z Transformation, Characteristics of Commonly Used Analog Filters. Application of above technique to the design of Butterworth & Chebyshev filters.	9	-
	Total	**45**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes, PO: Program Outcomes,
PSO: Program Specific Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	Proakis, J.G. &Manolakis, D.G	Digital Signal Processing: Principles Algorithms and Applications", Prentice Hall (India).
2	Sanjit K. Mitra	Digital Signal Processing
3	Oppenheim A.V. & Schafer, Ronald W	Digital Signal Processing", Pearson Education
4	Rabiner, L.R. and Gold B	Theory and applications of DSP

THEORY SEMESTER VII

Course Title	**Optical Fiber Communication**				
Course Code	**EC-4313**				
Schemes & Credit	L	T	P	C	**Sem VII**
	3	0	0	3	
Pre-requisites for this course (if any):	1.Knowledge of Modulation Techniques 2. Knowledge of Communication System				
The Course objectives are to	• Impart knowledge of the basic of Optical Fiber l Communication system. • Impart knowledge of the basics of OFC schemes like TDM, . • Performance analysis of Different material used for core fiber.				

Course Outcomes

- On the successful completion of the course, students will be able to:

CO1	Understand the basic of Optical Fiber communication system.	Understanding
CO2	Analyze transmission characteristics of optical fiber	Analyze
CO3	Understand the construction and operation of various optical sources and detectors.	Understanding
CO4	Understand then performance analysis of optical receivers and study of fiber joints	Understanding
CO5	Understand the introduction of optical fiber networks and amplifiers	Understanding

Detailed Contents Data communication and Network EC-4317			
Modules	**Contents**	**L(Hours)**	**T (Hours)**
I	Block diagram of optical fiber communication System. Advantages of Optical Fiber Communication.	3	-
II	Structure of Optical Waveguide , Light propagation in optical Fiber using ray theory , acceptance angle ,numerical apertures, Skew rays, Wave theory for optical propagation ,modes in a planar and cylindrical guide ,mode volume ,single mode fibers, cutoff wavelength , mode field diameter, effective refractive index and group and mode delay factor for single mode fiber.	15	-
III	Attenuation in optical Fibers, intrinsic and extrinsic absorption, Linear and Non Linear Scattering ,Fiber bend losses, Dispersion and pulse broadening, intramodal and intermodal dispersion for step and graded index Fiber , modal noise ,overall fiber dispersion for multimode and mono mode fiber , Dispersion Shifted Fibers , Modal Birefringes and polarization mode dispersion .	15	-
IV	Basic concept Einstein relation , population inversion ,optical feedback and threshold condition , direct and indirect band gap, semiconductors spontaneous and stimulated Emission in p-n junction , threshold current density, Hetero junction & DH Structure, semiconductors injection lasers and & characteristics of injection laser .Drawback and advantages of LED,LH LED , LED structures and characteristics .	15	-
V	Requirement of photo detection p-n photodiode ,Characteristics of photo detectors,p-i-n photodiode and avalanche photodiode ,phototransistors and photo conductors .Direct detection receiver performance consideration ,Noise sources in OFC , Noise in pin and APD receivers, Receiver structure .	10	-
VI	Principal components of an optical Fiber communication system, source laminations, optical transmitter circuits, LED and laser drive circuits optical receiver block diagram, simple circuits for pre-amplifier, automatic gain control and equalization, Regenerative repeater, BER of optical receiver, channel losses, ISI penalty and optical power budgeting for digital optical fiber system, line coding, analog systems, Direct intercity and sub carrier intensity modulation using AM, FM and PM Block diagram and detection principle of coherent optical Fiber system.	16	
	Total	**73**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	**AUTHOR**	**TITLE**
1	John MS Senior	Optical fiber Communication, PHI, 3rd Ed 2010
2	G.B. Keiser	Optical fiber Communication Mc Graw-Hill,5th Ed 2017
3	Wilson & Hawkes	Optoelectronic, PHI, 3rd Ed,2018

Study Online materials, Web Site, etc: https://nptel.ac.in/courses/117101054

Course Details

1	Course Title	**Artificial Neural Networks**			
2	Course Code	**EC 4314**			
3	Credit Hour per Week	L	T	P	Total
		3	0	0	3
4	Program(s) in which the course is offered	**B.Tech.ECE Branch**			
5	Level &Year at which this course is offered:	**4th Year/7th Sem**			
6	Pre-requisites for this course (if any):	**1.Elementary Mathematics**			
7.	Software Required:	**MATLAB**			
8	Name of Faculty member responsible for the course:	**Dr Zakir Ali**			

Aim & Objectives

Aim of the Course	The aim of Artificial Neural Networks is **to realize a very simplified model of the human brain**.
The Course objectives :	• Symbolic Processing. • Non-algorithmic Processing. • Reasoning. • Perception. • Communication. • Ability to Learn. • Imprecise knowledge. • Planning

Course Outcomes:

1. Know the main provisions neuromathematics;
2. Know the main types of neural networks;
3. Know and apply the methods of training neural networks;
4. Know the application of artificial neural networks;

5.To be able to formalize the problem, to solve it by using a neural network

EC-013/4314 Artificial Neural Networks

I Introduction:

Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks.

Learning Process:

Error correction learning, memory-basedlearning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory and adaptation.

II & III Artificial neurons: Neural networks and architectures, introduction, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture.

Geometry of Binary threshold neurons and their networks, Pattern recognition, convex sets and convex hulls, space of Boolean functions, binary neurons for pattern classification, nonlinear separable problems, capacity of TLN, XOR solution.

Perceptron learning algorithm, perceptron convergence theorem, pocket algorithm, Back propagation and other learning algorithms Multilayered architecture, back propagation learning algorithm, applications of feed forward neural networks, reinforcement learning.

IV Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications&Defuzzificataions, Fuzzy Controller, Industrial applications.

V Adaptive Resonance Theory

Building blocks of adaptive resonance, Adaptive Resonance Theory

Genetic Algorithm (GA)

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications

Text Books:

1. S. Rajsekaran& G.A. Vijayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications" Prentice Hall of India.
2. N.P. Padhy," Artificial Intelligence and Intelligent Systems" Oxford University Press.

Reference Books:

3. SimanHaykin," NeuralNetowrks"Prentice Hall of India
4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.
5. Kumar Satish, "Neural Networks" Tata Mc Graw Hill

THEORY SEMESTER-7

Course Title	Satellite communication				
Course code	**EC-4315**				
Scheme and Credits	L	T	P	C	Semester vii
	3	0	0	3	
Pre-requisites(if any)	**1. Knowledge of EMFT.** **2. Knowledge of Analog & Digital comm.**				
Course Objectives	• To become familiar with satellite system and its application. • Study of satellite orbits & launching mechanism. • Link design for satellite earth station. • Satellite access tech for various users				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Able to learn the fundamentals of satellite communication				Understanding
CO2	Able to understand transfer of information from one earth station to another.				Understanding
CO3	Able to analyze the link design for satellite system				Analyze
CO4	Able to understand satellite sub-system and launching method.				Understanding
CO5	Able to understand different satellite services and access techniques				Understanding

Detailed Contents	Satellite communication	EC-4315	
Modules	**Contents**	**L(Hours)**	**T (Hours)**
I	Elements of Satellite Communication, Orbital mechanics ,look angle and orbit determination,Launches & launch vehicle, orbital effects & Geostationary Orbit.	07	-
II	Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.	12	-
III	Modulation and multiplexing techniques for satellite links: FM, pre-emphasis and de-emphasis, S/N ratios for FM video transmission, digital transmission, digital modulation and demodulation, TDM. Multiple access: FDMA, TDMA, DAMA and CDMA.	10	-
IV	Error control for digital satellite links: error detection and correction, channel capacity, error control coding, convolution codes, linear and cyclic block codes. Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc.	09	-
V	Introduction of various satellite systems: VSAT, low earth orbit and non-geostationary, direct broadcast satellite television and radio, satellite navigation and the global positioning systems.	05	-
	Total	**43**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	Pratt, Bostian, Allnutt.	Satellite Communications John Wiley & Sons- 3rd edition 2019
2	Dennis Roddy	Satellite Communications McGraw-Hill- Fourth edition 2017
3	Tri T. Ha	Digital Satellite Communications. McGraw-Hill- 3rd edition 2016

Electronics materials, Web Site, etc: www.tutorialspoint.com ,www.nptel.ac.in

LABORATORY **SEMESTER-7**

Course Title	DIGITAL SIGNAL PROCESSING LAB				
Course code	**EC**-40316				
Scheme and Credits	L	T	P	C	Semester 7th
		0	2	1	
Pre-requisites(if any)	**1 Digital Signal Processing Theory.** **2 C and MATLAB Programming.**				
Course Objectives	1. To perform DSP algorithms like convolution, correlation, DFT, FFT in software using a computer language such as C with TMS320C6713 floating point Processor. 2. To design and simulate various discrete time signals and digital filter types like IIR-Butterworth. 3. Chebyshev filter. 4.FIR using window techniques.				

Course Outcomes	On the successful completion of the course, students will be able to:	
CO1	Able to learn DSP algorithms like convolution, correlation, DFT, FFT in software using a computer language such as C with TMS320C6713 floating point Processor.	Understanding
CO2	To Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital filter types like IIR-Butterworth,	Analyzing
CO3	To Analyze and Observe Magnitude and phase characteristics Chebyshev and FIR window-design.	Analyzing
CO4	Able to analyze the FIR using window techniques	Analyzing
CO5	Able to understand and demonstration of IIR filters	Understanding

DIGITAL SIGNAL PROCESSING LAB-40316

Sno.	**Contents**
1	Sampling & Waveform Generation.
2	Quantization
3	PCM Encoding
4	Delta Modulation
5	Digital Modulation Schemes (ASK, PSK, FSK)
6	Error Correcting Codes
7	DFT Computation.
8	Fast Fourier Transform.
9	FIR Filter implementation.
10	IIR Filter implementation.
11.	DSP Processor Implementation
12.	Computational Experiments with Digital Filters

LABORATORY SEMESTER-7

Course Title	Communication Lab- III				
Course code	**EC-40317**				
Scheme and Credits	L	T	P	C	Semester VII
	-	0	2	1	
Pre-requisites(if any)	**1. Knowledge of Communication System.** **2. Knowledge of signals and its types.**				
Course Objectives	• Impart knowledge of the basic of Optical Fiber l Communication system. • Impart knowledge of the basics of OFC schemes like TDM, . • Performance analysis of Different material used for core fiber.				

Course Outcomes

On the successful completion of the course, students will be able to:

CO1	Understand the basic of Optical Fiber communication system.	Understanding
CO2	Analyze transmission characteristics of optical fiber	Analyze
CO3	Understand the construction and operation of various optical sources and detectors.	Understanding
CO4	Understand then performance analysis of optical receivers and study of fiber joints	Understanding
CO5	Understand the introduction of optical fiber networks and amplifiers	Understanding

Communication lab -III EC- 40317

Sno.	Contents
1	Setting up fiber optics analog Link
2	Calculate the Value of Critical angle for Total Internal Reflection
3	Calculate the Value of Numerical Aperture
4	Verification through voice signal transmission.
5	Study of losses in optical fiber.
6	Setting up fiber optic digital link.
7	Transmission of TDM signal using fiber optic digital link
8	To establish PC to PC communication link using optical glass fiber & RS 232 interface

THEORY SEMESTER-8

Course Title	Wireless communication				
Course code	**EC-4316**				
Scheme and Credits	L	T	P	C	Semester viii
	3	0	0	3	
Pre-requisites(if any)	**Knowledge of Electronics communication engineering ,Antennas**				
Course Objectives	• To introduce the concepts and techniques associated with wireless communication and to understand the emerging technologies of wireless and mobile communications • To know the evolution of Mobile communication and cell concept to improve capacity of the system • To know the types of channel coding techniques, data transmission modes and services of GSM and CDMA.				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Able to understand the new trends in mobile/wireless communications networks				Understanding
CO2	Able to understand different multiple access techniques in mobile communication.				Understanding
CO3	Able to understand hand-off and interference concepts				Understanding
CO4	Able to understand & apply cellular concepts like frequency reuse, fading, equalization & diversity.				Applying
CO5	Able to understand the concept of GSM and CDMA in real time applications				Understanding

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Detailed Contents	Wireless communication EC-4316		
Modules	**Contents**	**L(Hours)**	**T (Hours)**
I	Evolution of mobile radio communication fundamentals. Large scale pathloss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels and types of fading,	10	-
II	Spread spectrum modulation techniques: Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum (FHSS), performance of DS-SS, performance of FH-SS, modulation. performance in fading and multipath channels, fundamentals of equalization, equalizer in communication receiver, survey of equalization techniques, linear equalizer, linear equalizer, non-linear equalization, diversity techniques, RAKE receiver.	11	-
III	Characteristics of speech signals, quantization techniques, vocoders, linear predictive coders, time division multiple access, space division multiple access, and frequency division multiple access.	7	-
IV	Cellular concepts, Frequency reuse and Channel assignment strategies, Handoff strategies, Interference and system capacity improving coverage and capacity in cellular systems Introduction to wireless networks, 2G, 3G wireless systems, wireless standards.	8	-
V	GSM system for mobile: Services and feature, System architecture, Radio subsystem channel types, Frame structure. CDMA: Frequency and channel specifications, forward and reverse CDMA channel.	6	-
	Total	**42**	**-**

Suggested Books

S.N.	AUTHOR	TITLE
1	T.S. Rappaport	Wireless Communication-Principles and practice", Pearson-2/E 2010
2	. D. R. Kamilo Fehar	"Wireless digital communication - 2015
3	. Haykin S & Moher M	"Modern wireless communication", Pearson, 2005.

Electronics materials, Web Site, etc: www.tutorialspoint.com ,www.nptel.ac.in

THEORY SEMESTER-8

Course Title	Data communication and Network				
Course code	**EC-4317**				
Scheme and Credits	L	T	P	C	Semester VIII
	3	0	0	3	
Pre-requisites(if any)	**Knowledge of communication engineering and coding theory**				
Course Objectives	• To become familiar with data communication and its fundamentals. • Understanding set of rules and procedures that mediate the exchange of information between communication devices. • Understanding networks standards, protocols and architecture. • To familiar with addressing schemes.				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	Able to understand network communication using layered concept.				Understanding
CO2	Able to understand OSI and TCP/IP architecture model				Understanding
CO3	Able to understand various types of transmission media, network devices and parameters of evaluation of performance for each media and devices.				Understanding
CO4	Able to apply the addressing for Local area network system.				Applying
CO5	Able to understand the operation behind various application layer protocols like HTTP, FTP, SMTP, TELNET etc				Understanding

Department of Electronics & Communication Engineering, IET BU Jhansi

Detailed Contents Data communication and Network EC-4317

Modules	Contents	L(Hours)	T (Hours)
I	INTRODUCTION: Network structure, network architectures. The OSI reference model, services, standardization, other architectures, Connection oriented and connection less services, example networks. The Physical Layer: Transmission media, EIA RS-232C, EIA RS-449.Pulse code modulation. FDM & TDM .Circuit switching, Packet switching, Hybrid switching. Polling, CCITT X.21, Ethernet.	12	-
II	The Data Link Layer: Basic link protocols. Character oriented and bit oriented protocols. The ALOHA protocols. IEEE standard 802 for LAN, framing, Error control, Flow control.	8	-
III	The Network Layer: Design Issues. Routing algorithms. Congestion control Algorithms. Subnet concept, Virtual circuit and Data gram Subnet, Flow control, Internetworking, Bridges, Routers, Gateways and different level switches.	9	-
IV	The Transport Layer: Design Issues. Connection management. Study of Internet and ATM transport layer protocols. Internet Issues: Principles of bridges and routers. The TCP/IP Protocol suite, Overview of TCP/IP. Addressing, Subnetting and network layer protocols.	8	-
V	Application layer services: DNS, DHCP, FTP, TFTP, SMTP, SNMP, HTTP, WWW.	7	-
	Total	**44**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	Forouzan	Data Communications & Networking, TMH-5th edition 2017
2	Andrew S. Tanenbaum	Computer Networks, PHI India- 5th edition 2010
3	William Stallings	Data & Computer Communication, Prentice Hall-5th edition 2000.

Electronics materials, Web Site, etc: www.nptel.ac.in

CourseTitle	**BIOMEDICAL SIGNAL PROCESSING**				
Coursecode	EC 4318				
Category	Professional Core Course				
SchemeandCredits	L	T	P	C	Semester VIII
	3	1	0	4	
Pre-requisites(ifany)	Desirable– Knowledge of signal processing				
Course Objectives	The objective of this course is to impart 1. Understand practical problems in objective analyses of biomedical signals. 2. Understand the theoretical background underlying the use of digital signal processing and statistical techniques for biomedical applications. 3. Identify the best solution for specific problems by considering the benefits and limitations of various digital signal processing approaches.				

Course Outcomes

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

CO1	1. Understand how biosignals (after acquisition) are processed in one and higher dimensions.	Understanding
CO2	1. Demonstrate advanced knowledge of biomedical signal and image processing methods by being able to describe the theory and mathematics.	Understanding
CO3	Demonstrate an understanding of signal representation and processing across a range of biomedical devices.	Understanding
CO4	Apply advanced knowledge in biomedical image processing to develop and implement biomedical algorithms for processing biomedical images and critically interpret their success.	Applying
CO5	Understand what biomedical signals are, the different noise analysis methods, and how contrast can be enhanced using advanced mathematical methods.	understanding

Detailed Contents

Module	Contents	L(Hours)	T (Hours)
I	Introduction to Bio-Medical Signals: Classification, Acquisition and Difficulties during Acquisition. Basics of Electrocardiography,Electroencephalography, Electromyography & electro-retinography Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field.	10	-
II	ECG: Measurementof Amplitude and Time Intervals, QRS Detection (Different Methods), ST Segment Analysis, Arrhythmia Analysis, Portable Arrhythmia Monitors.	10	-
III	Data Reduction: Turning Point algorithm, AZTEC Algorithm, Fan Algorithm, Huffman and Modified Huffman Coding, Run Length Coding	10	-
IV	EEG:Neurological Signal Processing, EEG characteristic, linear prediction theory, Sleep EEG, Dynamics of Sleep/Wake transition. Study of pattern of brain waves, Epilepsy-Transition, detection andEstimation.	10	-
V	Therapeutic and Physiotherapy Equipment: Type of cardic pacemakers, cardic brillator, kidney machine,short wave diathermy, microwave diathermy, rasound therapy Unit. Patient safety : Electric shock hazard, leakage current, text ruments for checking safety parameters for biomedical equipment.	12	-
	Total	**52**	**-**

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	N. Vyas , S. Khalid	Biomedical Signal Processing Laxmi Publications; First edition (1 January 2012), **ISBN-13 :** 978-9381159040
2	Prof. Rakesh Kumar	Bio-Medical Signal ProcessingS.K. Kataria & Sons; Reprint 2011 edition (1 January 2011), **ISBN-13 :** 978-9380027265

Electronics materials , Web Site, etc:www.nptel.ac.in

THEORY SEMESTER-8

Course Title	**Random Signal Theory**				
Course code	**EC-4319**				
Scheme and Credits	L	T	P	C	Semester viii
	3	0	0	3	
Pre-requisites(if any)	**Knowledge of set theory and probability theory**				
Course Objectives	This gives basic understanding of random signals and processing				
Course Outcomes On the successful completion of the course, students will be able to:					
CO1	**Understand** the concepts of Random variable and its properties .				Understanding
CO2	**Understand** the response of linear time Invariant system for a Random Processes.				Understanding
CO3	Utilization of Random signals and systems in Communications and SignalProcessing areas				Understanding
CO4	**Determine** the Spectral and temporal characteristics of Random Signals				Applying

Detailed Contents Random Signal Theory EC-4317			
Modules	**Contents**	**L(Hours)**	**T (Hours)**
I	Probability & Random Variable: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events, Random Variable- Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties	12	-
II	Operations On Single & Multiple Random Variables – Expectations: Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic and Non-monotonicransformations of Continuous Random Variable, Transformation of a Discrete Random Variable. Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, ConditionalDistribution and Density – Interval conditioning, Statistical Independence. Sum of Two RandomVariables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions. Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, JointlyGaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables..	14	-
III	Random Processes – Temporal Characteristics: The Random Process Concept, Classification ofProcesses, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, SecondOrder and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input andOutput. .	9	-

IV	Random Processes – Spectral Characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum,Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output. .	8	-
	Total	43	-

L: Lecture, T: Tutorial, P: Practical, C: Credits, CO: Course Outcomes

Suggested Books

S.N.	AUTHOR	TITLE
1	Peyto Z Peebles,	Probability, Random Variables & Random Signal Principles, TMH, 4th Edition, 2008.
2	Pillai	Probability, Random Variables and Stochastic Processes , , PHI, 7th Edition, 2008. Athanasios Papoulis and S.Unnikrishna

1. Electronics materials, Web Site, etc: www.nptel.ac.in, website:www.tatamcgrawhill.com