SYLLABI BOOK

BACHELOR OF TECHNOLOGY
ELECTRONICS & COMMUNICATION ENGINEERING

Department of Electronics & Communication Engineering
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Dharmsinh Desai University
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TEACHING SCHEME FOR THE COURSE
B. TECH. ELECTRONICS & COMMUNICATION
(Admission Year 2017)

SEMESTER I (2017-2018)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF111	Mathematics-I	4	0	0	60	40	-	-	100	4
AF122	Basic Electrical & Electronics Engineering	4	0	2	60	40	25	25	150	5
CT116	Elements of Linux & C Programming - I	4	0	2	60	40	25	25	150	5
CT112	Engineering Graphics	4	0	3	60	40	50	-	150	5.5
ES110	Environmental Sciences	3	0	0	60	-	40	-	100	3
AF136	Workshop Practice - 1	0	0	2	-	-	50	-	50	1
AF124	Engineering Mechanics	3	0	2	60	40	25	25	150	4
									850	27.5

SEMESTER II (2017-2018)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF201	Mathematics-II	4	0	0	60	40	-	-	100	4
AF212	Electronics Principles	4	0	2	60	40	25	25	150	5
AM210	Engineering Economics and Principles of Management	3	0	0	60	-	40	-	100	3
CT215	C Programming II	4	0	2	60	40	25	25	150	5
AF214	Mechanics of Solids	3	0	2	60	40	25	25	150	4
CT217	Electronics Workshop	0	0	2	-	-	50	-	50	1
AF215	Heat Power	4	0	2	60	40	25	25	150	5
									850	27

SEMESTER III (2018-2019)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF301	Mathematics-III	4	0	0	60	40	-	-	100	4
CI308	Linear Electronics - I	4	0	2	60	40	25	25	150	5
EC302	Electronic Instrumentation	4	0	2	60	40	25	25	150	5
EL304	Network Analysis	4	0	2	60	40	25	25	150	5
IC302	Digital Electronics	4	0	2	60	40	25	25	150	5
AF310	Financial & Managerial Accounting	3	0	0	60	-	40	-	100	3
									800	27

SEMESTER IV (2018-2019)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF411	Mathematics-IV	4	0	0	60	40	-	-	100	4
CL418	Linear Electronics - II	4	0	2	60	40	25	25	150	5
EC404	Object Oriented Programming	4	0	2	60	40	25	25	150	5
CI416	Electrical Machines & Power	4	0	2	60	40	25	25	150	5
EC406	CMOS VLSI Design	4	0	2	60	40	25	25	150	5
EL405	Applied Mathematics Laboratory	0	0	2	-	-	25	25	50	1
									750	25

SEMESTER V (2019-2020)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF501	Professional Communication – 1	1	0	2	50	-	-	50	100	2
EC511	Microcontroller Applications	4	0	2	60	40	25	25	150	5
EC512	Electronic Communication	4	0	2	60	40	25	25	150	5
EC517	Electromagnetic Fields	4	1	0	60	40	50	-	150	5
EC507	Power Electronics	4	0	2	60	40	25	25	150	5
EC518	Control Theory	4	0	2	60	40	25	25	150	5
EC519	Term Project (Electronic Circuits)	0	0	2	-	-	50	-	50	1
									900	28

SEMESTER VI (2019-2020)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF601	Professional Communication - 2	1	0	2	50	-	-	50	100	2
EC604	Communication Systems	4	0	2	60	40	25	25	150	5
EC615	Advanced Microprocessors	4	0	2	60	40	25	25	150	5
EC611	Digital Signal Processing	4	0	2	60	40	25	25	150	5
EC610	Microwave & Antennas	4	0	2	60	40	25	25	150	5
EC407	Audio Video Engineering	0	0	2	-	-	25	25	50	1
EC616	Term Project (Microcontroller)	0	0	2	-	-	50	-	50	1
									800	24

SEMESTER VII (2020-2021)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
EC723	Term Project (Software)	0	0	2	-	-	-	50	50	1
EC717	Coding Theory & Compression Techniques	4	0	0	60	40	-	-	100	4
	Elective I									
EC720	Image Processing	4	0	2	60	40	25	25	150	5
EC724	Biomedical Instrumentation	4	0	2	60	40	25	25	150	5
EC725	Advanced Digital Signal Processing	4	0	2	60	40	25	25	150	5
	Elective II									
EC724	Wireless Communication	4	0	0	60	40	-	-	100	4
EC726	Radar and Navigation	4	0	0	60	40	-	-	100	4
	Elective III									
EC722	Embedded Systems	4	0	2	60	40	25	25	150	5
EC727	RF Circuit Design	4	0	2	60	40	25	25	150	5
	Elective IV									
EC702	Data & Computer Communications	4	0	2	60	40	25	25	150	5
EC728	Satellite Communication	4	0	2	60	40	25	25	150	5
EC729	Fiber Optic Communication	4	0	2	60	40	25	25	150	5
									700	24

SEMESTER VIII (2020-2021)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF801	Project/Industrial Training	0	0	28	-	-	300	100	400	14
AF802	Seminar	0	4	0	-	-	50	50	100	4
									500	18

TEACHING SCHEME FOR THE COURSE
B. TECH. ELECTRONICS & COMMUNICATION
(Admission Year 2018)

SEMESTER I (2018-2019)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF111	Mathematics-I	4	0	0	60	40	-	-	100	4
ES110	Environmental Sciences	3	0	0	60	-	-	40	100	3
AF122	Basic Electrical & Electronics Engineering	4	0	2	60	40	25	25	150	5
CT116	Elements of Linux OS & C Programming – I	4	0	2	60	40	25	25	150	5
CT112	Engineering Graphics	4	0	3	60	40	-	50	150	5.5
AF124	Engineering Mechanics	3	0	2	60	40	25	25	150	4
AF136	Workshop Practice – 1	0	0	2	-	-	-	50	50	1
									850	27.5

SEMESTER II (2018-2019)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF201	Mathematics-II	4	0	0	60	40	-	-	100	4
AF212	Electronics Principles	4	0	2	60	40	25	25	150	5
AM210	Engineering Economics and Principles of Management	3	0	0	60	-	-	40	100	3
CT215	C Programming II	4	0	2	60	40	25	25	150	5
AF214	Mechanics of Solids	3	0	2	60	40	25	25	150	4
AF215	Heat Power	4	0	2	60	40	25	25	150	5
CT217	Electronics Workshop	0	0	2	-	-	-	50	50	1
									850	27

SEMESTER III (2019-2020)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF301	Mathematics-III	4	0	0	60	40	-	-	100	4
AF310	Financial & Managerial Accounting	3	0	0	60	-	-	40	100	3
CI308	Linear Electronics-I	4	0	2	60	40	25	25	150	5
EC302	Electronic Instrumentation	4	0	2	60	40	25	25	150	5
EL304	Network Analysis	4	0	2	60	40	25	25	150	5
IC302	Digital Electronics	4	0	2	60	40	25	25	150	5
EC303	Mathematical Computing Laboratory	0	0	2	-	-	25	25	50	1
									850	28

SEMESTER IV (2019-2020)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF411	Mathematics-IV	4	0	0	60	40	-	-	100	4
CL418	Linear Electronics-II	4	0	2	60	40	25	25	150	5
EC404	Object Oriented Programming	4	0	2	60	40	25	25	150	5
CI416	Electrical Machines & Power	4	0	2	60	40	25	25	150	5
EC406	CMOS VLSI Design	4	0	2	60	40	25	25	150	5
EL405	Applied Mathematics Laboratory	0	0	2	-	-	25	25	50	1
EC407	Audio Video Engineering	0	0	2	-	-	25	25	50	1
									800	26

SEMESTER V (2020-2021)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF501	Professional Communication – 1	1	0	2	50	-	50	-	100	2
EC511	Microcontroller Applications	4	0	2	60	40	25	25	150	5
EC512	Electronic Communication	4	0	2	60	40	25	25	150	5
EC517	Electromagnetic Fields	4	1	0	60	40	-	50	150	5
EC519	Term Project (Electronic Circuits)	0	0	2	-	-	-	50	50	1
EC518	Control Theory	4	0	2	60	40	25	25	150	5
EC507	Power Electronics	4	0	2	60	40	25	25	150	5
									900	28

SEMESTER VI (2020-2021)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF601	Professional Communication - 2	1	0	2	50	-	50	-	100	2
EC615	Advanced Microprocessors	4	0	2	60	40	25	25	150	5
EC604	Communication Systems	4	0	2	60	40	25	25	150	5
EC610	Microwave & Antennas	4	0	2	60	40	25	25	150	5
EC616	Term Project (Microcontroller)	0	0	2	-	-	-	50	50	1
EC611	Digital Signal Processing	4	0	2	60	40	25	25	150	5
EC617	Automated Electronics	4	0	2	60	40	25	25	150	5
									900	28

SEMESTER VII (2021-2022)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
EC723	Term Project (Software)	0	0	2	-	-	-	50	50	1
EC717	Coding Theory & Compression Techniques	4	0	0	60	40	-	-	100	4
	Elective I									
EC720	Image Processing	4	0	2	60	40	25	25	150	5
EC724	Biomedical Instrumentation	4	0	2	60	40	25	25	150	5
EC725	Advanced Digital Signal Processing	4	0	2	60	40	25	25	150	5
	Elective II									
EC724	Wireless Communication	4	0	0	60	40	-	-	100	4
EC726	Radar and Navigation	4	0	0	60	40	-	-	100	4
	Elective III									
EC722	Embedded Systems	4	0	2	60	40	25	25	150	5
EC727	RF Circuit Design	4	0	2	60	40	25	25	150	5
	Elective IV									
EC702	Data & Computer Communications	4	0	2	60	40	25	25	150	5
EC728	Satellite Communication	4	0	2	60	40	25	25	150	5
EC729	Fiber Optic Communication	4	0	2	60	40	25	25	150	5
									700	24

SEMESTER VIII (2021-2022)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF801	Project/Industrial Training	0	0	28	-	-	300	100	400	14
AF802	Seminar	0	4	0	-	-	50	50	100	4
									500	18

TEACHING SCHEME FOR THE COURSE
B. TECH. ELECTRONICS & COMMUNICATION
(Admission Year 2019)

SEMESTER I (2019-2020)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF111	Mathematics-I	4	0	0	60	40	-	-	100	4
AF122	Basic Electrical & Electronics Engineering	4	0	2	60	40	25	25	150	5
CT116	Elements of Linux & C Programming - I	4	0	2	60	40	25	25	150	5
CT112	Engineering Graphics	4	0	3	60	40	50	-	150	5.5
ES110	Environmental Sciences	3	0	0	60	-	40	-	100	3
AF136	Workshop Practice - 1	0	0	2	-	-	50	-	50	1
AF124	Engineering Mechanics	3	0	2	60	40	25	25	150	4
									850	27.5

SEMESTER II (2019-2020)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF201	Mathematics-II	4	0	0	60	40	-	-	100	4
AF212	Electronics Principles	4	0	2	60	40	25	25	150	5
AM210	Engineering Economics and Principles of Management	3	0	0	60	-	40	-	100	3
CT215	C Programming II	4	0	2	60	40	25	25	150	5
AF214	Mechanics of Solids	3	0	2	60	40	25	25	150	4
CT217	Electronics Workshop	0	0	2	-	-	50	-	50	1
AX215	Elements of Mechanical Engineering	4	0	2	60	40	25	25	150	5
EN201	English	2	0	2	40	-	50	-	90	3
									940	30

SEMESTER III (2020-2021)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF301	Mathematics-III	4	0	0	60	40	-	-	100	4
CI308	Linear Electronics - I	4	0	2	60	40	25	25	150	5
EC302	Electronic Instrumentation	4	0	2	60	40	25	25	150	5
EL304	Network Analysis	4	0	2	60	40	25	25	150	5
IC302	Digital Electronics	4	0	2	60	40	25	25	150	5
AF310	Financial & Managerial Accounting	3	0	0	60	-	40	-	100	3
EC303	Mathematical Computing Laboratory	0	0	2	-	-	25	25	50	1
									850	28

SEMESTER IV (2020-2021)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF411	Mathematics-IV	4	0	0	60	40	-	-	100	4
CL418	Linear Electronics - II	4	0	2	60	40	25	25	150	5
EC404	Object Oriented Programming	4	0	2	60	40	25	25	150	5
CI416	Electrical Machines & Power	4	0	2	60	40	25	25	150	5
EC406	CMOS VLSI Design	4	0	2	60	40	25	25	150	5
EL405	Applied Mathematics Laboratory	0	0	2	-	-	25	25	50	1
EC407	Audio Video Engineering	0	0	2	-	-	25	25	50	1
									800	26

SEMESTER V (2021-2022)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
EC511	Microcontroller Applications	4	0	2	60	40	25	25	150	5
EC512	Electronic Communication	4	0	2	60	40	25	25	150	5
EC517	Electromagnetic Fields	4	1	0	60	40	50	-	150	5
EC507	Power Electronics	4	0	2	60	40	25	25	150	5
EC518	Control Theory	4	0	2	60	40	25	25	150	5
EC519	Term Project (Electronic Circuits)	0	0	2	-	-	50	-	50	1
									800	26

SEMESTER VI (2021-2022)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
EC604	Communication Systems	4	0	2	60	40	25	25	150	5
EC615	Advanced Microprocessors	4	0	2	60	40	25	25	150	5
EC611	Digital Signal Processing	4	0	2	60	40	25	25	150	5
EC617	Automated Electronics	4	0	2	60	40	25	25	150	5
EC610	Microwave & Antennas	4	0	2	60	40	25	25	150	5
EC616	Term Project (Microcontroller)	0	0	2	-	-	50	-	50	1
									800	26

SEMESTER VII (2022-2023)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
EC723	Term Project (Software)	0	0	2	-	-	-	50	50	1
EC717	Coding Theory & Compression Techniques	4	0	0	60	40	-	-	100	4
	Elective I									
EC720	Image Processing	4	0	2	60	40	25	25	150	5
EC724	Biomedical Instrumentation	4	0	2	60	40	25	25	150	5
EC725	Advanced Digital Signal Processing	4	0	2	60	40	25	25	150	5
	Elective II									
EC724	Wireless Communication	4	0	0	60	40	-	-	100	4
EC726	Radar and Navigation	4	0	0	60	40	-	-	100	4
	Elective III									
EC722	Embedded Systems	4	0	2	60	40	25	25	150	5
EC727	RF Circuit Design	4	0	2	60	40	25	25	150	5
	Elective IV									
EC702	Data & Computer Communications	4	0	2	60	40	25	25	150	5
EC728	Satellite Communication	4	0	2	60	40	25	25	150	5
EC729	Fiber Optic Communication	4	0	2	60	40	25	25	150	5
									700	24

SEMESTER VIII (2022-2023)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF801	Project/Industrial Training	0	0	28	-	-	300	100	400	14
AF802	Seminar	0	4	0	-	-	50	50	100	4
									500	18

TEACHING SCHEME FOR THE COURSE
B. TECH. ELECTRONICS & COMMUNICATION
(Admission Year 2020)

SEMESTER I (2020-2021)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF111	Mathematics-I	4	0	0	60	40	-	-	100	4
AF122	Basic Electrical & Electronics Engineering	4	0	2	60	40	25	25	150	5
CT116	Elements of Linux & C Programming – I	4	0	2	60	40	25	25	150	5
CT112	Engineering Graphics	4	0	3	60	40	50	-	150	5.5
ES110	Environmental Sciences	3	0	0	60	-	40	-	100	3
AF136	Workshop Practice – 1	0	0	2	-	-	50	-	50	1
AF124	Engineering Mechanics	3	0	2	60	40	25	25	150	4
									850	27.5

SEMESTER II (2020-2021)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF201	Mathematics-II	4	0	0	60	40	-	-	100	4
AF212	Electronics Principles	4	0	2	60	40	25	25	150	5
AM210	Engineering Economics and Principles of Management	3	0	0	60	-	40	-	100	3
CT215	C Programming II	4	0	2	60	40	25	25	150	5
AF214	Mechanics of Solids	3	0	2	60	40	25	25	150	4
CT217	Electronics Workshop	0	0	2	-	-	50	-	50	1
AX215	Elements of Mechanical Engineering	4	0	2	60	40	25	25	150	5
EN201	English	2	0	2	40	-	50	-	90	3
									940	30

SEMESTER III (2021-2022)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF301	Mathematics-III	4	0	0	60	40	-	-	100	4
CI308	Linear Electronics – I	4	0	2	60	40	25	25	150	5
EC302	Electronic Instrumentation	4	0	2	60	40	25	25	150	5
EL304	Network Analysis	4	0	2	60	40	25	25	150	5
IC302	Digital Electronics	4	0	2	60	40	25	25	150	5
AF310	Financial & Managerial Accounting	3	0	0	60	-	40	-	100	3
EC303	Mathematical Computing Laboratory	0	0	2	-	-	25	25	50	1
									850	28

SEMESTER IV (2021-2022)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF411	Mathematics-IV	4	0	0	60	40	-	-	100	4
CL418	Linear Electronics – II	4	0	2	60	40	25	25	150	5
EC404	Object Oriented Programming	4	0	2	60	40	25	25	150	5
CI416	Electrical Machines & Power	4	0	2	60	40	25	25	150	5
EC406	CMOS VLSI Design	4	0	2	60	40	25	25	150	5
EL405	Applied Mathematics Laboratory	0	0	2	-	-	25	25	50	1
EC407	Audio Video Engineering	0	0	2	-	-	25	25	50	1
									800	26

SEMESTER V (2022-2023)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
EC511	Microcontroller Applications	4	0	2	60	40	25	25	150	5
EC512	Electronic Communication	4	0	2	60	40	25	25	150	5
EC517	Electromagnetic Fields	4	1	0	60	40	50	-	150	5
EC507	Power Electronics	4	0	2	60	40	25	25	150	5
EC518	Control Theory	4	0	2	60	40	25	25	150	5
EC519	Term Project (Electronic Circuits)	0	0	2	-	-	50	-	50	1
									800	26

SEMESTER VI (2022-2023)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
EC604	Communication Systems	4	0	2	60	40	25	25	150	5
EC615	Advanced Microprocessors	4	0	2	60	40	25	25	150	5
EC611	Digital Signal Processing	4	0	2	60	40	25	25	150	5
EC617	Automated Electronics	4	0	2	60	40	25	25	150	5
EC610	Microwave & Antennas	4	0	2	60	40	25	25	150	5
EC616	Term Project (Microcontroller)	0	0	2	-	-	50	-	50	1
									800	26

SEMESTER VII (2023-2024)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
EC723	Term Project (Software)	0	0	2	-	-	-	50	50	1
EC717	Coding Theory & Compression Techniques	4	0	0	60	40	-	-	100	4
	Elective I									
EC720	Image Processing	4	0	2	60	40	25	25	150	5
EC724	Biomedical Instrumentation	4	0	2	60	40	25	25	150	5
EC725	Advanced Digital Signal Processing	4	0	2	60	40	25	25	150	5
	Elective II									
EC724	Wireless Communication	4	0	0	60	40	-	-	100	4
EC726	Radar and Navigation	4	0	0	60	40	-	-	100	4
	Elective III									
EC722	Embedded Systems	4	0	2	60	40	25	25	150	5
EC727	RF Circuit Design	4	0	2	60	40	25	25	150	5
	Elective IV									
EC702	Data & Computer Communications	4	0	2	60	40	25	25	150	5
EC728	Satellite Communication	4	0	2	60	40	25	25	150	5
EC729	Fiber Optic Communication	4	0	2	60	40	25	25	150	5
									700	24

SEMESTER VIII (2023-2024)

Subject Code	Subject	Teaching Scheme (hrs/week)			Examination Scheme					
		L	T	P	Theory	Sess	Prac	TW	Total	Credits
AF801	Project/Industrial Training	0	0	28	-	-	300	100	400	14
AF802	Seminar	0	4	0	-	-	50	50	100	4
									500	18

(AF111) MATHEMATICS - I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	0	0	100	4	0	0	4

OBJECTIVES

- Ability to analyze and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

DETAILED SYLLABUS

[1] DIFFERENTIAL CALCULUS

Applications of differential calculus to geometrical problems, equation of tangent & normal, angle between two curves, sub tangent, subnormal, length of tangent & length of normal, pedal equation, radius of curvature of plane curves in Cartesian, polar and parametric equations, radius of curvature at origin by Newton's method and by method of expansion.

[2] SUCCESSIVE DIFFERENTATION

Leibnitz's theorem, Maclaurin's theorem, Taylor's theorem, Applications to obtain expansion of functions.

[3] INTEGRAL CALCULUS

Curve Tracing, applications for finding area, length of arc, volume and surface area of solids of revolutions

[4] REDUCTION FORMULA

sinx dx, cosx dx, sinx cosx dx, tanx dx and cotx dx etc.

[5] BETA AND GAMMA FUNCTION

Definition, properties, relation between Beta and Gamma functions, use in evaluation of definite integrals

.

[6] ELLIPTIC AND ERROR FUNCTIONS

Definitions and Properties and use in evaluation of definite integrals.

[7] FIRST ORDER DIFFERENTIAL EQUATIONS

Formation of differential equations, general and particular solution, equations of first order & first degree of the type variables separable, homogenous, reducible to homogenous, linear & exact and reducible to these forms. Application to geometrical and physical problems.

LEARNING OUTCOMES

- To answer at least about the convergence or divergence of integral when integral is not easily evaluated using techniques known.
- Able to evaluate the volume and surface area of the solid generated by revolving the solids by Integration.
- Apply the knowledge of differential equation to solve some practical problems such as electrical circuits, Newton's Law of cooling and problem related to orthogonal trajectories.
- Apply the knowledge of differentiation to obtain the series of function.
- Able to evaluate curvature of the given function.

TEXT / REFERENCE BOOKS

1) Engineering Mathematics-II, Shanti Narayan, S. Chand & Company Ltd
2) Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna publishers
3) Engineering Mathematics-I, Shanti Narayan, S. Chand & Company Ltd
4) Applied Mathematics, P. N. & J. N. Wartikar, S. Chand & Company Ltd
5) Engineering Mathematics-I, I. B. Prasad, S. Chand & Company Ltd

(ES110) ENVIRONMENTAL SCIENCE

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	40	0	100	3	0	0	3

OBJETIVE

- The objective for this course is to bring awareness about sustainable development is a key to the future of mankind. Continuing problems of pollution, solid waste disposal, degradation of environment, issues like economic productivity and national security, global warming, the depletion of ozone layer and loss of biodiversity have made everyone aware of environmental issues. Managing environmental hazards have become very important. It is now even more critical than ever before for mankind as a whole to have a clear understanding of environmental concerns and to follow sustainable development practices.

DETAILED SYLLABUS

[1] THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope and importance, Need for public awareness.

[2] NATURAL RESOURCES

Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams, and their effects on forests and tribal people

Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefit and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification

Role of an individual in conservation of natural resources. Equitable use of resources of sustainable lifestyles

[3] ECOSYSTEMS

Concept of an ecosystem, Structure and function of an ecosystem, producers, consumers and decomposers, Energy flow in the ecosystem

Ecological succession, Food chains, food webs and ecological pyramids

Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

[4] BIODIVERSITY AND ITS CONSERVATION

Introduction definition: Genetic, species and ecosystem diversity

Bio-geographical classification of India

Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, national and local levels
India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity, habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India
Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity

[5] ENVIRONMENTAL POLLUTION

Definition, Causes, effects and control measures of:
Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards
Solid waste management, causes, effects and control measures of urban and industrial wastes
Role of an individual in prevention of pollution, Pollution case studies
Disaster management: floods, earthquake, cyclone and landslides

[6] SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development, Urban problems related to energy
Water conservation, rain water harvesting, watershed management
Resettlement and rehabilitation of people: its problems and concerns. Case studies
Environmental ethics: Issues and possible solutions
Climate change: Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
Case studies
Wasteland reclamation, Consumerism and waste products
Environment Protection Act: Air (Prevention and Control of Pollution) Act, Water (Prevention &Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act
Issues involved in enforcement of environmental legislation
Public awareness

[7] HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations, population explosion, Family Welfare Program, environment and human health, human rights, Value education
HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environmental and human health
Case studies

[8] FIELD WORK

Visit to a local area to document environmental assets (river/forest/grassland/hill/mountain)
Visit to a local polluted site - Urban/Rural/Industrial/Agricultural
Study of common plants, insects, birds
Study of simple ecosystems – pond, river, hill, slopes etc.

LEARNING OUTCOMES

After completion of this course students will be able to understand …

- The meaning of environment, ecology, ecosystems, biotic & abiotic components, food chains & webs
- Natural resources, biodiversity, hotspots, threats to biodiversity

- Factors causing environmental pollution, prevention of pollution, role of an individual in pollution control & abatement and disaster management
- Social issues related to environmental science, water conservation, rain water harvesting, environmental ethics, climate change, wasteland reclamation, consumerism and waste products, environment protection act and public awareness
- Issues of population growth, population explosion, human health and rights
- Field work related to ecosystems, polluted sites, and species

TEXT / REFERENCE BOOKS

1) Erach Bharucha Textbook of Environmental Studies; Second Edition, Universities Press: Hyderabad, 2013.
2) Poonia, M. P.; Sharma, S. C. Environmental studies; Khanna Publishing House: New Delhi, 2017.
3) Rajagopalan, R. Environmental Studies; Oxford University Press: India, 2015.
4) Varandani, N. S. Basics of Environmental studies; Lambert Academic Publishing: Germany, 2013.
5) Basak, A. Environmental Studies; Dorling Kindersley: India, 2009.
6) Dhameja, S. K. Environmental studies; S. K. Kataria and Sons: New Delhi, 2007.
7) Rao, C. S. Environmental Pollution Control Engineering; Wiley publishers: New Delhi, 2006.
8) Brunner, R. C. Hazardous Waste Incineration; McGraw Hill: Michigan, 1989.
9) Clark, R. S. Marine Pollution; Clanderson Press Oxford: Bath, 2001.
10) Trivedy, R. K. Handbook of Environmental Laws, Acts, Guidelines, Compliances & standards; B. S. publications: Hyderabad, 2005.
11) Jadhav, H.; Bhosale, V. M. Environmental Protection and Laws; Himalaya Pub. House: Delhi, 1995.
12) Agarwal, K. C. Environmental Biology; Nidi Publ.: Bikaner, 2001.
13) Bharucha, E. The Biodiversity of India; Mapin Publishing: Ahmedabad, India, 2002.
14) Cunningham, W.P.; Cooper; Gorhani, T. H. E.; Hepworth, M.T., Environmental Encyclopedia; Jaico Publ. House: Mumbai, 2001.
15) De, A. K. Environmental Chemistry; Wiley Eastern: New Delhi, 2006.
16) Gleick, H. P. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security; Stockholm Env. Institute Oxford Univ. Press: New York, 1993.
17) Hawkins, R.E., Encyclopedia of Indian Natural History; Bombay Natural History Society: Bombay, 1987.
18) Heywood, V. H.; Waston, R. T. Global Biodiversity Assessment; Cambridge Univ. Press: Cambridge, 1995.
19) Mckinney, M.L.; School, R.M. Environmental Science systems & Solutions; Web enhanced edition: USA, 1996.
20) Miller, T.G. Jr.; Spoolman, S. E. Environmental Science; Cengage learning: Wadsworth, 2014.
21) Odum, E.P. Fundamentals of Ecology; W.B. Saunders: USA, 1971.
22) Rao, M. N.; Datta, A.K. Waste Water treatment; Oxford & IBH Publ.: New Delhi, 1987.
23) Sharma, B. K., Environmental Chemistry; Goel Publ. House: Meerut, 2001.
24) Townsend, C., Harper, J.; Michael, B. Essentials of Ecology; Blackwell: Oxford, 2008.
25) Trivedi, R. K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II; B. S. Publications, Hyderabad, 2010.
26) Trivedi, R. K.; Goel, P. K. Introduction to air pollution; ABD Publishers: Jaipur, 2003.
27) Wanger, K. D., Environmental Management; W.B. Saunders Co. Philadelphia, USA, 1998.

(AF122) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To expose the students to the concepts of various types of electrical, electronic and magnetic circuits and their applications.

DETAILED SYLLABUS

[1] FUNDAMENTALS OF CURRENTELECTRICITYANDDCCIRCUITS
Introduction, Computation of Resistance at constant temperature, Temperature dependence of Resistance, Computation of Resistance at different temperatures, Ohm's law statement, Illustration and limitation, Kirchhoff's laws-statement and illustration, Resistance in parallel and current division technique, Method of solving a circuit by Kirchhoff's laws.

[2] MAGNETIC CIRCUITS
Introduction, Definition of Magnetic quantities, Magnetic circuit, Leakage flux, Fringing effect, Comparison between magnetic and electric circuits.

[3] ELECTROMAGNETICINDUCTION
Introduction, Magnetic effect of electric current, Current carrying conductor in magnetic field, Law of electromagnetic induction, Induced emf, Self-Inductance(L), Mutual Inductance(M), and Coupling coefficient between two magnetically coupled circuits(K), inductor in series.

[4] AC FUNDAMENTALS
Introduction, Waveform terminology, Concept of 3-phase emfgeneration, Root mean square (RMS) or effective value, Average Value of AC, Phasor representation of alternating quantities, Analysis of AC circuit.

[5] SINGLE PHASE ACCIRCUITS
Introduction, j operator, Complex algebra, Representation of alternating quantities in rectangular and polar forms, RL series circuit, RC series circuit, RLC series circuit, Admittance and its components, Simple method of solving parallel AC circuits, Resonance.

[6] ELECTRICAL MACHINES
Working principles of DC machine, Transformer, Three phase Induction Motor.

[7] DIODE THEORY
Semiconductor theory, Conduction in crystals, Doping source, The unbiased diode, Forward bias, Reverse bias, Linear devices, The diode graph, Load lines, Diode approximations, DC resistance of a diode.

[8] DIODE CIRCUITS
The sine wave, The transformer, The half wave rectifier, The full wave rectifier, The bridge rectifier, The capacitor input filter, Diode clipper and clamper circuit.

[9] SPECIAL PURPOSE DIODES

The Zener diode, The Zener regulator, Optoelectronic devices

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Analyze the various electric and magnetic circuits.
- Understand 1-phase and 3-phase supply terminology.
- Understand the effect of R, L and C in single phase ac circuit.
- Compare various diode circuits and rectifier circuits.
- Understand significance of resonance in series and parallel RLC circuit.
- Identify the various parts of electrical machines and their working.

TEXT / REFERENCE BOOKS

1) Basic Electrical, Electronics and Computer Engineering, R. Muthusubramanian, S. Salivahanan, K. A. Muraleedharan, 2nd Edition, Tata McGraw Hill.
2) Electronics Principles, Albert Paul Malvino, 6th Edition, Tata McGraw Hill.
3) Electrical Engineering, B. L. Theraja, 23rd Edition, S. Chand & Company Ltd.
4) Electrical Machines, B. L. Theraja, 23rd Edition, S. Chand & Company Ltd.

(CT116) ELEMENTS OF LINUX OS & C PROGRAMMING - I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To understand the basic concepts of Linux OS and study the usages of Linux commands. Also understand the basics of C programming language.

DETAILED SYLLABUS

[1] BASICS OF OPERATING SYSTEM

[2] LINUX ARCHITECTURE
Kernel, shell and applications, Features of Linux, Basics of Command: Locating Commands, Types of Commands [Internal and External], Structure of Commands, Getting HELP: Commands like man, whatis, aprpos

[3] LINUX USAGE
Logging in to a Linux System, Switching between virtual consoles and the graphical environment, Changing your password, The root user, Editing text files.

[4] GENERAL PURPOSE UTILITY
cal, date, echo, bc, script, who, uname

[5] THE FILE SYSTEM
Linux File Hierarchy Concepts, Some Important Directories, Current Working Directory, File and Directory Names, Absolute and Relative Pathnames, Changing Directories, Listing Directory Contents, Copying Files and Directories, Moving and Renaming Files and Directories, Creating and Removing Files, Creating and Removing Directories

[6] THE FILE SYSTEM IN-DEPTH
Partitions and File systems, In odes and Directories, cp and in odes, mv and in odes, rm and in odes, Hard Links, Symbolic (or soft) Links, The Seven Fundamental File types, Checking Free Space, Mounting storage devices, Compressing and Archiving Files.

[8] FINDING AND PROCESSING FILES
locate, locate Examples, find, Basic find Examples, find and logical Operators, find and Permissions, find and Numeric Criteria, find and Access Times, Executing commands with find, find Execution Examples, The GNOME Search Tool.

[9] BASICS OF PROCESS

[10] TEXT EDITOR: VI

[11] SHELL PROGRAMMING
Scripting Basics, Creating Shell Scripts, Generating Output, Handling Input, Exit Status, Control Structures, Conditional Execution, File Tests, String Tests, for and sequences,

continue and break, Using positional parameters, handling parameters with Spaces, Scripting at the command line, Shell Script debugging.

[12] OVERVIEW OF C

[13] CONSTANTS, VARIABLES AND DATA TYPES

[14] OPERATORS AND EXPRESSIONS

[15] MANAGING INPUT OUTPUT OPERATIONS

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Familiar with Linux Operating System.
- Able to write a shell script.
- Understand C Language Basics.
- Able to implement C Codes.

TEXT / REFERENCE BOOKS

1) Unix : Concepts and Applications, Sumitabha Das, 4th Edition, Tata McGraw Hill.
2) Programming in ANSI C, Balaguruswamy, 5th Edition, Tata McGraw Hill
3) Let Us C, Yashvant Kanetkar, 12th Edition, BPB Publication
4) Fundamental of Digital Circuits, Ashok N. Kamthane, 2nd Edition, Pearson Education

(CT112) ENGINEERING GRAPHICS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	3	60	40	50	0	150	4	0	1.5	5.5

OBJECTIVES

- The course is aimed at developing basic graphic skills in preparation of basic drawings
- Developing skills in reading and Interpretation of engineering drawings to efficiently communicate ideas graphically
- To understand dimension and annotation two-dimensional engineering drawings
- To understand objects in two-dimensional views to improve visualization skills
- Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional

DETAILED SYLLABUS

[1] ENGINEERING CURVES

Introduction to different curves & their applications, constructions of curves used in engineering such as Conics (Ellipse, Parabola, Hyperbola), Cycloidal curves (Cycloid, Epi-Cycloid, Hypo-Cycloid), Involutes, Archemedian spirals with tangents & normals.

[2] PROJECTIONS OF POINTS AND STRAIGHT LINES

Introduction to principal planes, Projections of points, Projections of Lines, construction for H.T. & V.T. Simple applications of projection of points and lines

[3] PROJECTIONS OF PLANES

Introduction to different types of planes, Projections of regular planes such as square, rectangle, triangle, circle, pentagon, hexagon, rhombus etc.

[4] PROJECTIONS OF SOLIDS

Introduction to different types of solids, Projections of Right &Regular Solids (Prisms, Pyramids, Cylinder and Cone)

[5] ORTHOGRAPHIC PROJECTIONS

First angle projection method and third angle projection method. Dimensioning techniques and methods, Conversion of pictorial views into Orthographic Projections with dimensions, Sectional orthographic projection, Orthographic vies with full and half section, special sections.

[6] ISOMETRIC PROJECTIONS

Introduction to Isometric planes, Isometric scale, Conversion of Orthographic views into Isometric Projections and views.

[7] DEVELOPLMENT OF SURFACES

Introduction, methods of development, Development of lateral surfaces of right regular solids (Prism, Cylinder, Pyramid and Cone)

TEXT / REFERENCE BOOKS

1) Engineering Drawing, N. D. Bhatt, Charotar Publication
2) Engineering Drawing Vol.1 & Vol. 2, P.J. Shah, S. Chand
3) Fundamentals of Engineering Drawing., Luzadder, Peachpit Press
4) A Text Book of Geometrical Drawing, P. S. Gill, S. K. Kataria Publications.
5) A Text Book of Machine Drawing, P. S. Gill, S. K. Kataria Publications

(AF124) ENGINEERING MECHANICS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

OBJECTIVE

- Comprehensive and theory-based understanding of the natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.

DETAILED SYLLABUS

STATICS

[1] INTRODUCTION, ENGINEERING AND S.I. UNITS, ACCURACY IN ENGINEERING CALCULATIONS, VECTORS COMPOSITION AND RESOLUTION, CONCEPT OF RIGID BODY

[2] CONCURRENT COPLANAR FORCE SYSTEM AND THEIR RESULTANT OF A FORCE SYSTEM USING ANALYTICAL AS WELL AS GRAPHICAL METHOD

[3] NON-CONCURRENT COPLANAR FORCE SYSTEM, PARALLEL AND NON-PARALLEL FORCE SYSTEM

[4] EQUILIBRIUM OF FORCE SYSTEM. CONCEPT OF INTERNAL FORCE, FREE BODY DIAGRAM

[5] FRICTION: FRICTION ON AN INCLINED PLANE, LADDER FRICTION, WEDGE FRICTION, SCREW FRICTION, BELT AND ROPE DRIVE

[6] CENTRE OF GRAVITY OF LINES, PLANE FIGURES, VOLUMES, BODIES AND PAPPU'S THEOREMS.

[7] PRINCIPLE OF VIRTUAL WORK AND ITS APPLICATION

[8] SUPPORT REACTION FOR STATICALLY DETERMINATE BEAMS, TYPES OF BEAMS, TYPES OF SUPPORTS

[9] SIMPLE CASES OF CONCURRENT FORCE SYSTEM IN SPACE, EQUATION OF STATIC FOR RIGID BODY ASSEMBLIES FOR GENERAL FORCE SYSTEM
DYNAMICS

[10] REVIEW OF PARTICLE KINEMATICS, MOTION OF CONNECTED BODIES, D'ALEMBERTS PRINCIPLE

[11] IMPACT, MOMENTUM AND PRINCIPLE OF MOMENTUM

[12] INSTANTANEOUS CENTRE IN PLANE MOTION
[13] WORK POWER AND ENERGY

[14] MASS MOMENT OF INERTIA IN ROTATIONAL MOTION

[15] VIBRATIONS OF SDOF SYSTEMS.

Term work: - Problems based on theory of engineering mechanics and Practical

LEARNING OUTCOMES

- The students get knowledge of methods of analysis, Use scalar and vector analytical techniques
- Determine resultants and apply conditions of static equilibrium to plane force systems.
- Apply fundamental concepts of kinematics and kinetics of particles and rigid bodies to the analysis of simple and practical problems
- Solve problems in kinematic and dynamic systems
- A basic understanding of the laws and principles of mechanics.

TEXT / REFERENCE BOOKS

1) Mechanics for Engineers, Beer and E. R. Johnston Jr., McGraw Hill Publication
2) Engineering Mechanics: Statics & Dynamics, A. K. Tayal, Umesh Publication
3) Engineering Mechanics, Khurmi, S. Chand
4) Engineering Mechanics, S. Ramamrutham, Dhanpatrai Publication
5) Engineering Mechanics, Russell Hibbeler, S. Chand

(AF136) WORKSHOP PRACTICE - I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	0	0	50	0	50	0	0	1	1

OBJECTIVES

- Students belonging to all branches of engineering are made understand workshop layout, importance of various sections/shops of workshop, General safety rules and work procedure of work shop
- Students belonging to all branches of engineering are made understand importance or workshop practice in engineering and are given exposure to use practically by themselves of basic tools and equipment used for performing basic operations related to carpentry, tin smithy and plumbing individually.

DETAILED SYALLABUS

[1] INTRODUCTION TO WORKSHOP
Workshop layout, importance of various sections/shops of workshop, type of jobs done in each shop, General safety rules and work procedure of work shop

[2] TIN SMITHY (ONE JOB)
Tin smithy tools like –hammers, stakes, scissors etc. sheet metal operations such as shearing, bending, joining, safety precautions, demonstration of various operations

[3] CARPENTRY (ONE PRACTICE JOB AND ONE JOINT JOB)
Carpentry tools like –saw, planner, chisels, hammers, pallet, making gauge, vice, tee square, rule etc., carpentry operations such as marking, sawing, planning, chiselling, grooving, boring, joining, type of woods and carpentry hardware, safety precaution, demonstration of various operations by using hardware

[4] PIPE FITTING (ONE JOB)
Pipe fitting tools, pipe fitting operations such as marking, cutting, bending, threading, assembling, dismantling etc. Types of various spanners such as flat, fix, ring box-adjustable etc, Safety precautions, demonstration of various operations.

LEARNING OUTCOMES

- After successful completion of this course, students belonging to all branches of engineering would be able to understand and able to use themselves of basic workshop tools used in carpentry, tin smithy and plumbing.

TEXT / REFERENCE BOOKS

1) Manual Developed by Mechanical Engineering Department.
2) Work shop technology, A. K. Hajrachaudhari& S. K. Hajrachaudhari, Media Promoters & Publishers
3) ITB Hand book, Engineering Industry training board

4) Work shop Technology Vol. I & II, Gupta & Kaushik, S. Chand

(AF201) MATHEMATICS – II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	0	0	100	4	0	0	4

OBJECTIVES

- Ability to analyze and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

DETAILED SYLLABUS

[1] PARTIAL DIFFERENTIATION & ITS APPLICATIONS

Partial derivatives, Homogenous functions, Euler's theorem, Total derivatives - Differentiation of implicit functions, Change of variables, errors and approximations, Maxima & Minima of functions of two variables, Lagrange's method of undetermined multipliers.

[2] MULTIPLE INTEGRALS & THEIR APPLICATIONS

Double integrals, definition evaluation, change of order of integration, double integrals in polar co-ordinates, area enclosed by plane curves, Triple integrals, change of variables, volume of solids.

[3] INFINITE SERIES

Introduction, Definitions, Convergence, divergence and Oscillation of a series, P-test, Comparison test, Ratio test, Root test, Higher ratio test, Rabbe's test, Log test, Alternating Series, Leibnitz's rule.

[4] COMPLEX NUMBER

Definition, elementary operations, Argan's diagram, De-Moivre's theorem, and its applications to expand $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ respectively, To expand $\sin^n\theta$, $\cos^n\theta$ and $\sin^m\theta$. $\cos^n\theta$ in a series of Sines or Cosines of multiples of θ, Hyperbolic functions, Formulae of hyperbolic functions, Inverse hyperbolic functions, Logarithm of complex quantities. Separation of real and imaginary parts. C+iS method.

[5] LAPLACE TRANSFORMS

Introduction, Definition Transforms of elementary functions, properties of Laplace transforms, Inverse transforms, Note on partial fractions, Transforms of derivatives, Transforms of integrals. Multiplication and division by t, convolution theorem.

LEARNING OUTCOMES

At the end of the course student should be able to …

- Obtain Laplace transform of standard Mathematical functions.
- Evaluate Partial Derivatives and apply the knowledge to solve some practical problems such has constrained optimization problems and other problems involving Partial Differentiation.
- Understand the concept of Multiple Integration and its applications viz. Area and Volume.

- Obtain the behavior of Infinite series.
- Evaluate Exponential, Trigonometric and Hyperbolic Functions of a complex number

TEXT / REFERENCE BOOKS

1) Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers, Delhi
2) Applied Mathematics for Engineers and Physicists, Pipes & Harvill, McGraw Hill Kogakusha Ltd.
3) Applied Mathematics, P. N. & J.N. Wartikar, Pune Vidyarthi Grih Prakashan

(AF212) ELECTRONIC PRINCIPLES

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To present a perceptive understanding of the fundamentals of a bipolar junction transistor and its application. Further, nurturing the ability to design and analyze the performance of transistor amplifier using different types of biasing techniques. Expose the students to the concepts of various types of digital circuit as well as concept of signal and systems.

DETAILED SYLLABUS

[1] BIPOLAR JUNCTION TRANSISTOR:
The unbiased transistor, The biased transistor, Forward-reverse bias, The CE connection, Transistor characteristics, The Base and Collector curves.

[2] TRANSISTOR FUNDAMENTALS:
DC load lines, Base bias, Emitter bias, The Operating Point, The Transistor switch.

[3] TRANSISTOR BIASING:
Voltage divider bias, VDB analysis, VDB load line, Two-supply emitter bias, other types of bias, PNP Transistors.

[4] AC MODELS:
Base biased amplifier, Coupling and bypass capacitors, The superposition theorem for amplifiers, AC resistance of the emitter diode, AC beta, The grounded emitter amplifier, The AC model of a CE stage, Introduction to h - Parameters & Comparison with T & PI models.

[5] VOLTAGE AMPLIFIERS:
Voltage gain, The loading effect of input impedance, Multistage amplifiers, Swamped amplifier.

[6] CC AND CB AMPLIFIERS:
The CC amplifier, the AC model of an Emitter Follower, Types of coupling, Direct coupling, Darlington connections.

[7] CLASS A AND B POWER AMPLIFIERS:
The AC load line of a CE amplifier, AC load lines of other amplifier, Class A operation.

[8] OSCILLATORS:
Theory of sinusoidal oscillation.

[9] FREQUENCY DOMAIN:
The Fourier series, The spectrum of a signal, Frequency spectrum of periodic signal

[10] FREQUENCY MIXING:
Nonlinearity, Medium-signal, operation with one sine wave, Medium signal operation with Two sine waves.

[11] AMPLITUDE MODULATION:
Basic idea, Percent modulation, AM spectrum, the envelope detector, the super heterodyne Receiver.

[12] DIGITAL CIRCUITS:
Number systems, Complements, Error detecting codes, Boolean algebra, Logic gate ICs, RTL & DTL logic circuits, and Simple Combinational circuits, Half adder, Full adder

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Analyse and designing of the various transistor amplifier circuits.
- Understand the importance of RE, RC, CB and CE in transistor circuit.
- Compare various biasing techniques and its importance in design of circuit.
- Understand significance of feedback in amplifier circuit.
- Build their notion about the digital electronics circuit and its applications.
- Gain the insight of the signal and its frequency spectrum for random signal.
- Understand the concept of the modulation and its application in wireless communication.

TEXT / REFERENCE BOOKS

1) Electronic Principles, Albert Malvino and David Bates, 7th Edition, Tata McGraw Hill.
2) Digital Electronics, Morris Mano, 3rd Edition, Prentice Hall of India
3) Electronic Devices and Circuit Theory, Robert Boylestad and Louis Nashelsky, 7th Edition, Prentice Hall of India.
4) Digital Electronics, Anand Kumar, Prentice Hall of India

(AM210) ENGINEERING ECONOMICS AND PRINCIPLES OF MANAGEMENT

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	0	40	0	100	3	0	0	3

OBJECTIVES

- The need to understand the basics concepts of economics & management are important for the allocation of scarce resources of economy and proper utilization to generate the required products and services.
- Demand analysis and consumer behavior are the factors which teach about the equilibrium price. Types of markets, product pricing and factor pricing leads to a better understanding of a particular product or service demanded by the consumers.
- Production cost and revenue analysis is important for operation of a profitable business. Monetary & fiscal policies are important for the understanding of consumption, government expenditure, investment, exports and imports. It also educates us about the ways in which the government generates revenue and handles its expenditure for a stable economy.

DETAILED SYLLABUS

[1] BASIC CONCEPTS AND DEFINITIONS

Marshall, Robbins and Samuelsons' Definition of Economics
Positive and Normative Economics. Micro and Macro Economics.
Utility, goods and services.
Money and wealth.
Consumer Surplus and producer's surplus.

[2] DEMAND ANALYSIS AND CONSUMER BEHAVIOUR

Demand Function
Law of demand
Elasticity of demand and its types
Price, income and cross elasticity
Measures of demand elasticity
Factors of production
Advertising elasticity
Law of supply, equilibrium between demand & supply.

[3] MARKETS, PRODUCT PRICING AND FACTOR PRICING

Concept of perfect competition
Monopoly and monopolistic competition (meaning and characteristics)
Control of monopoly
Price discrimination and dumping
Concept of Duopoly and Oligopoly
Kinked demand curve (price leadership model with reference to oligopoly)

[4] PRODUCTION, COST AND REVENUE ANALYSIS

Production and production function
Short run and long run production function
Cost analysis
Various concepts of cost
Total fixed cost, total variable cost
Average fixed cost, average variable cost, average cost & marginal cost, Opportunity cost.
Basic concepts of revenue
Relationship between average revenue and marginal revenue
Break even analysis; meaning, explanation.

[5] MONEY

Meaning, functions, types, Monetary policy
Meaning, objectives, tools, fiscal policy
Meaning, objectives, tools Banking; meaning, types, functions, Central Bank- RBI; its functions, concepts, Cash Reverse Ratio, bank rate, repo rate, reverse repo rate, Statutory Liquidity Ratio. Functions of central and commercial banks Inflation, Deflation, Stagflation, Monetary cycles, new economic policy, Liberalization, Globalization, privatization, fiscal policy of the government.

[6] PRINCIPLES OF MANAGEMENT

Meaning of management
Management process: planning, organizing, leading and controlling
Managerial role, types of managers, management skills
Theory of management by Taylor, Gilbreth, Gantt, Fayol, Weber, Barnard, Follett, McGregor.
Planning: Meaning, goals, feature, steps in planning process, hierarchy of organizational plans, importance and limitations, types of planning, BCG matrix, Porter's Five forces model.
Organization: Organizational design and structure, types of organizational structure, integration, downsizing, power and its types, human resource management, HR planning, recruitment, selection, socialization, training and development.
Leading: Meaning, qualities of a leader, types of leadership styles, Maslow's hierarchy of needs, Theory X and Theory Y, Herzberg's dual factor theory.
Control: Meaning, steps in control process, key result areas, responsibility centers, role of budget personnel, budget department, budget committee, types of budgets, different types of costs, and auditing.

TERMWORK

Students will be required submit assignment based on topics covered in the syllabus such as calculation of breakeven point, demand analysis of a product or service, GDP, and inflation

LEARNING OUTCOMES

After completion of this course students will be able to understand …

- Students will understand the definitions of economics, micro & macroeconomics, utility, money, wealth, consumer and producer surplus
- Students will understand demand, function of demand, elasticity, factors of production, supply & demand equilibrium

- Students will understand types of markets, price discrimination, dumping and kinked demand curve
- Students will understand production, short & long run production function, cost analysis, fixed cost, variable cost, revenue, breakeven analysis
- Students will understand monetary policy, fiscal policy, banking, instruments of monetary policy, liberalization, globalization, privatization, role of government in policy making and business cycles

TEXT / REFERENCE BOOKS

1) Modem Economics, H. L. Ahuja, S. Chand
2) Modem Economic Theory, K. K. Dewett, S. Chand
3) Monetary Economics, M. L. Seth, S. Chand
4) Engineering Economics, R. Paneerselvam, PHI publication.
5) Fundamentals of Management: Essential Concepts and Applications, Robbins S.P. and Decenzo David A, Pearson Education.
6) Economics: Principles of Economics, N Gregory Mankiw, Cengage Learning.
7) Introduction to Economics, T. R. Williamson, D. C. Health & Company.

(CT215) C PROGRAMMING - II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To implant the capability to develop logics which will help to create program, applications in C language.

DETAILED SYLLABUS

[1] ARRAYS
One-dimensional arrays, Multi-dimensional arrays, Dynamic arrays.

[2] CHARACTER ARRAYS AND STRINGS
String variables, Arithmetic Operations on Characters, Comparison of Strings, String handling functions, Table of String.

[3] USER-DEFINED FUNCTIONS
Need for user defined functions, A multi-function program, Elements of user defined function, Definition of functions, Return values and their types, Function calls, Function declarations, Functions with arguments, Function with multiple return values, Nesting of functions, Recursion, Passing arrays to functions

[4] STRUCTURES AND UNIONS
Introduction, Structures definition, Giving values to members, Structure initialization, Comparison of structure variables, Arrays of structures, Arrays within structure, Structure and function, Unions, Size of structures, Bit fields.

[5] POINTERS
Introduction, Understanding of pointers, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointers, Pointers expressions, Pointer increments and scale factor, Pointers and arrays, Pointers and character strings, Pointers on pointers, Pointer as function argument, Functions returning pointer, Pointers to functions, Pointers and structures.

[6] FILE MANAGEMENT IN C
Introduction, Defining and opening a file, Closing a file, Input/output operations on files, Error handling during I/O operations, Random access to files, Command line arguments.

[7] DYNAMIC MEMORY ALLOCATION
Allocating memory, Releasing the used space, Altering size of a block

[8] THE PREPROCESSOR
Macro substitution, File Inclusion, Compiler control directives

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Design, implement, test and debug programs that use arrays, character arrays, functions, structure, pointers.
- Describe and employ the strategies that are useful in dynamic memory allocation.
- Implement programming solutions using other features of the C language including recursion, macros, and compiler control directives.

TEXT / REFERENCE BOOKS

1) Programming in ANSI C, Balaguruswamy, 5th Edition, Tata McGraw Hill.
2) Let Us C, Yashvant Kanetkar, 12th Edition, BPB Publication.
3) Programming in C , Ashok N. Kamthane, 2nd Edition, Pearson Education
4) The C Programming Language, Kernighan and Ritchie, 2nd Edition, PHI Learning

(AF214) MECHANICS OF SOLIDS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess.	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	2	60	40	25	25	150	3	0	1	4

OBJECTIVES

- The objective of this course is to make the students understand the concept of stress and strain under different type loading conditions and different types of structures.
- Understanding of basic knowledge of maths and physics to solve real-world problems and to analyse simple problems in solid mechanics

DETAILED SYLLABUS

[1] SIMPLE STRESSES AND STRAINS

Introduction, stress, strain, tensile, compressive and shear stresses, Elastic limit, Hooke's law, Poisson's Ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus, Bars of Varying sections, Extension of tapering rods, Bars of uniform strength, temperature stresses, Hoop stress, stress on oblique sections, State of simple shear, Relation between Elastic constants

[2] MECHANICAL PROPERTIES OF MATERIALS

Ductility, Brittleness, Toughness, Malleability, Behaviour of ferrous and nonferrous metals in tension and compression, shear and bending tests, Standard test pieces, Influence of various parameters on test results, True and nominal stress, Modes of failure, Characteristic stress-strain curves, Strain hardening, Hardness, Different methods of measurement, Izod, Charpy and tension impact tests, Fatigue, Creep, Correlation between different mechanical properties

[3] BENDING MOMENT AND SHEAR FORCE

Bending moment, shear force in statically determinate beams subjected to uniformly distributed, concentrated and varying loads. Relation between bending moment, shear force and rate of loading

[4] MOMENT OF INERTIA

Concept of moment if Inertia, Moment of Inertia of plane areas, polar moment of Inertia, Radius of gyration of an area, Parallel Axis theorem, Moment of Inertia of composite Areas, product of Inertia, Principal axes and principal Moments of Inertia

[5] STRESSES IN BEAMS

Theory of simple bending, bending stresses, moment of resistance, modules of section, Built up and composite beam section, Beams of uniform strength, Distribution of shear stress in different sections

[6] TORSION

Torsion of circular. solid and hollow section shafts, shear stress angle of twist, torsional moment of resistance, power transmitted by a shaft, keys and couplings, combined bending and torsion, close coiled helical springs

[7] STRESSES IN CYLINDRICAL AND SPHERICAL SHELLS UNDER FLUID PRESSURE

[8] INELASTIC BENDING OF BEAMS

[9] PRINCIPAL STRESSES AND STRAIN

TERM WORK

PROBLEMS BASED ON THEORY OF ENGINEERING MECHANICS AND PRACTICAL

LEARNING OUTCOMES

The students get knowledge of

- Solve practical problems through evaluating the relationship between stress and strain
- Generate and sketch shear force and bending moment diagrams
- Derive and apply stress and strain relationships in single and compound members subject to axial force, bending moment and torsion
- Analysis of composite beams and shafts

TEXT / REFERENCE BOOKS

1) Strength of Materials, S. Ramamrutham, Dhanpatrai Publication
2) Strength of Materials, Sadhu Singh, Dhanpatrai Publication
3) Mechanics of Solid, R. S. Khurmi, S. Chand
4) Introduction to Solid Mechanics, Shames and Pitarresi, S. Chand
5) Strength of Materials , S. S. Bhavikatti, S. Chand
6) Mechanics of Solids **,** Stephen H. Crandall**,** S. Chand

(AF215) HEAT POWER

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- Students belonging to all branches of engineering are made to learn certain fundamental topics related to mechanical engineering so that they will have a minimum understanding of mechanical processes and basic equipment like boilers, compressors, I.C. engines, refrigeration and air conditioning etc.

DETAILED SYLLABUS

[1] PROPERTIES OF STEAM

Distinction between gas and vapour, sensible heat, latent heat, total heat and super heat of steam, condition of steam, dryness fraction, methods of determination of dryness fraction, internal energy of steam, specific volume, critical pressure and temperature.

[2] PROPERTIES OF GASES

Zeroth, first and second laws of thermodynamics, laws of perfect gases(Boyle's law, Charle's law, Regnault's law, Joule's law), Characteristic equation of gas, gas constants, internal energy, specific heat at constant pressure and specific heat at constant volume, relationship between specific heats, thermodynamic processes of perfect gases.

[3] FUELS & COMBUSTION

Solid, liquid and gaseous fuels used for boilers and I.C. engines, combustion of fuels, air required, products of combustion of fuel, analysis of flue gases, calorific value of fuels and its determination.

[4] BOILERS

Classification of boilers, Cochran & Babcock-wilcox boiler, boiler mountings and accessories, draught (Natural & Artificial).

[5] I. C. ENGINES

Prime movers, classification of prime movers with examples of each classes, advantages of I.C. engines over E.C. engines, classification of I.C. engines, thermodynamic air cycles (Carnot cycle, Constant volume auto cycle, Constant pressure Joule cycle, Diesel cycle), Air standard efficiency, construction and working of 2–stroke and 4–stroke cycle engines, P-v diagrams, determination of I.P., B.P., fuel supply in I.C. engines, ignition system of I.C. engines, Cooling of I.C. engines, Lubrication & governing of I.C. engines.

[6] SOLAR ENERGY

Introduction to solar energy systems.

TERM WORK

Term – work shall be based on the above syllabus

TEXT / REFERENCE BOOKS

1) Elements of Heat Engines (S.I. Units) , Vol: 1, By: R. C. Patel & C. J. Karamchandani, Publisher: Acharya Book Depo
2) Elements of Heat Engines (S.I. Units), By: N. C. Pandya & C. S. Shah, Publisher: Charotar Publishing house
3) Heat Engine, By: P. L. Ballaney, Khanna Publishers
4) A Course in Thermodynamics and Heat Engines, By: Kothandraman, Dhanpatrai Publication

(CT217) ELECTRONICS WORKSHOP

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	0	0	50	0	50	0	0	1	1

OBJECTIVE

- To understand the basic components of electrical and electronic circuit. To understand the various electronics software and its application.

DETAILED SYLLABUS

Digital Multi-meter, Power Supply, Function Generator, Cathode Ray Oscilloscope, Digital Oscilloscope, Measurement of Phase Difference in single phase circuit, Various Electrical and Electronics component like LED, LDR, Photodiode, MOSFET, MCB and Relay. Various Ports,

Cables and Connectors like RJ45, RS232 and CRO probe. Multisim - Circuit Simulator Software,

Printed Circuit Board Designing Software – Proteus, PCB Manufacturing Process, Soldering and De-soldering of circuit and component on PCB, Open Circuits /Short Circuit Testing on PCB.

Linux Installation Steps and Projects.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand different types of basic electrical and electronic components.
- Analyze the various electronics circuit using software.
- Design the PCB layout of various electronics circuit.
- Identify and design various types of cable and connector.

TEXT / REFERENCE BOOKS

1) Essentials of Electronic Devices, Thomas L. Floyd, Edition 4th, Charles E. Merrill
2) Electronic Principles, Albert Paul Malvino and David J. Bates, Edition 7th, Tata McGraw-Hill
3) Electronic Components and Materials Principles, Dr.Madhuri A Joshi, Edition 2nd, Shroff Publishers & Distributors PVT. LTD.
4) Fundamentals of Electrical Engineering and Electronics, B. L. Theraja, Edition 1st, S. Chand & Company Ltd

(AX215) ELEMENTS OF MECHANICAL ENGINEERING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- Students belonging to all branches of engineering are made to learn certain fundamental topics related to mechanical engineering so that they will have a minimum understanding of mechanical processes and basic equipment like boilers, compressors, I.C. engines, refrigeration and air conditioning etc.

DETAILED SYLLABUS

[1] INTRODUCTION

Systems of units, Pure and working substance, properties of substance, energy, thermodynamic system, surroundings and system boundary, Path and point functions, Thermodynamic equilibrium, law of conservation of energy, Specific heat capacity, thermodynamic process and cycle

[2] PROPERTIES OF STEAM

Distinction between gas and vapour, Steam formation, Sensible heat, Latent heat, Total heat and super heat of steam, Condition of steam, Dryness fraction, Properties of steam i.e. Enthalpy, Internal energy, Density and Specific volume, Critical pressure and temperature of steam, External work of evaporation and internal latent heat. Combined separating and throttling calorimeter

[3] PROPERTIES OF GASES

Zeroth, first and second laws of thermodynamics, laws of perfect gases (Boyle's law, Charle's law, Regnault's law, Joule's law), Characteristic equation of gas, gas constants, internal energy, specific heat at constant pressure and specific heat at constant volume, relationship between specific heats, thermodynamic processes of perfect gases (constant volume, constant pressure, constant temperature, isentropic and polytropic)

[4] FUELS AND COMBUSTION

Introduction, Classification of Solid fuels, Liquid Fuels, Gaseous fuels, LPG, CNG and bio fuels, Calorific values, Combustion of fuels, Minimum air required for combustion of fuels

[5] REGRIGERATION AND AIR CONDITIONING

Introduction, Evaporation, Refrigerating effect, Unit of refrigeration and COP, Important refrigerants, Refrigerating systems i.e. Air refrigerating system, Ammonia absorption refrigerating system and Vapour compression refrigerating system, Analysis of vapour compression refrigeration system, i.e. COP, mass flow rate, heat rejected from condenser, power consumption etc. Window and split air conditioners: principles and working

[6] BOILERS

Introduction, Classification, Cochran & Babcock-Wilcox boiler, Evaporation in boiler, Equivalent evaporation, Boiler efficiency, functioning of boiler mountings and accessories. Boiler draught, Classification and comparison of boiler draught systems

[7] I. C. ENGINES

Prime mover and its classification, advantages of I.C. engines over E.C. engines, classification of I.C. engines, thermodynamic air cycles i.e. Carnot cycle, Constant volume OTTO cycle and Diesel cycle, Air standard efficiency, construction and working of 2–stroke and 4–stroke cycle engines, p-v diagrams, I.C. engine performance. Calculations of Indicated power, brake power, efficiencies, specific fuel consumption

[8] AIR COMPRESSORS

Introduction, Classification, Working of reciprocating air compressors, air compressor terminology, Work of compression, Reciprocating compressor efficiency, Introduction and classification of rotary air compressors, Comparison between reciprocating and rotary compressor**.**

LEARNING OUTCOMES

After successful completion of this course, students belonging to all branches of Engineering would be able to understand fundamental aspects related to important mechanical processes and basic equipment like boilers, compressors, I.C. engines etc.

TEXT / REFERENCE BOOKS

1) Elements of Heat Engines (S.I. Units) Vol. 1, R. C. Patel & C. J. Karamchandani, Acharya Book Depot, Vadodara
2) Elements of Mechanical Engineering, A. V. Mehta, Everest publishing house, Pune
3) Elements of Mechanical Engineering, P. S. Desai & S. B. Soni, AtulPrakashan, Ahmedabad
4) Heat Engine, P. L. Ballaney, Khanna Publishing Company
5) A course in Thermal Engineering, Domkundwar, S and Kothandaraman, C. P., Dhanpat Rai and Sons

(EN201) ENGLISH

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW*	Prac	Total	Lect	Tut	Prac	Total
2	0	2	40	-	50	-	90	2	0	1	3

* Marks includes Viva based on TW

DETAILED SYLLABUS

[1] VOCABULARY BUILDING

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations.

[2] BASIC WRITING SKILLS

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

[3] IDENTIFYING COMMON ERRORS IN WRITING

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

[4] NATURE AND STYLE OF SENSIBLE WRITING

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion

[5] WRITING PRACTICES

Comprehension, Précis Writing, Essay Writing

[6] ORAL COMMUNICATION

(This unit involves interactive practice sessions in Language Lab) Listening Comprehension, Pronunciation, Intonation, Stress and Rhythm, Common, Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal Presentations

TEXT / REFERENCE BOOKS

1) Practical English Usage. Michael Swan. OUP. 1995.
2) Remedial English Grammar. F.T. Wood. Macmillan.2007
3) On Writing Well. William Zinsser, Harper Resource Book. 2001
4) Study Writing. Liz Hamp-Lyons and Ben Heasly, Cambridge University Press. 2006.
5) Communication Skills. Sanjay Kumar and PushpLata, Oxford University Press. 2011.
6) Exercises in Spoken English, parts I-III. CIEFL, Hyderabad. Oxford University Press

(AF301) MATHEMATICS - III

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	0	0	100	4	0	0	4

OBJECTIVES

- Ability to analyze and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

DETAILED SYLLABUS

[1] FOURIER SERIES

Euler's Formulae, condition for a Fourier expansion, functions having points of discontinuity, change of interval, odd & even functions, Expansion of odd & even periodic functions, Half-range series.

[2] MATRICES

Fundamental concepts, operations, associated with matrices, matrix method of solution of simultaneous equations, Rank of Matrix, Linear dependence of vectors, consistency of a system of linear equations, characteristic equations, Eigen vectors and Eigen roots, Cayley Hamilton theorem.

[3] ORDINARY DIFFERENTIAL EQUATIONS

Linear differential equations of higher order with constant coefficients, equations reducible to linear equations with constant coefficients, Simultaneous linear equations with constant coefficients. Application to engineering problems.

[4] PARTIAL DIFFERENTIAL EQUATIONS

Introduction, formation, linear equation of first order, non-linear equations of first order-Charpit's method, homogenous linear equations with constant coefficient to find the complementary functions & the particular integral, non-homogenous linear equations with constant coefficients. Method of separation of variables-vibrating string problem, Heat flow equation etc.

[5] LAPLACE TRANSFORMS

Application to differential equation, simultaneous linear equation with constant coefficients.

LEARNING OUTCOMES

At the end of the course students are able to …

- Obtain Fourier Series of a periodic function into the sum of a (possibly infinite) set of simple oscillating functions, namely sines and cosines.
- Model physical processes using partial and ordinary differential equation and same can be solved analytically as well numerically.
- Solve basic initial value problems, directly without determining a general solution with the help of Laplace Transformation.
- Characterize the solutions of a differential equation with respect to initial values and analyze the behavior of solutions.
- Use numerical methods to find an approximate solution of algebraic and transcendental equations using appropriate method
- Solve wave and heat equation.

TEXT / REFERENCE BOOKS

1) Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publisher
2) A Text Book of Applied Mathematics, P. N. & J. N. Wartikar, Pune Vidyarthi Grih Prakashan
3) Mathematics for Engineering, Chandrika Prasad, Pothishala Pvt. Ltd.
4) A Text Book of engineering Mathematics, Dr. K. N. Srivastva & G. K. Dhawan, Prentice Hall Publication

(AF310) FINANCIAL & MANAGERIAL ACCOUNTING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
3	0	0	60	40	0	0	100	3	0	0	3

OBJECTIVES

- The need to understanding concepts of accountancy is essential in daily life of individuals as well as company where engineering is applied. Thus for better decision making, principles of accounting are applied to produce financial statements which can be appealing to the prospective stakeholders. Traditional and modern approach provides learning to understand different perspectives of accountancy which have evolved over the years.
- Management accounting is for understanding the Cost-Volume-Profit analysis. Concepts such as ratio analysis along with breakeven analysis are important to compare different companies of the same industry, to do fundamental analysis of a company's financial statements.

DETAILED SYLLABUS

[1] FINANCIAL ACCOUNTING – AN INTRODUCTION

Introduction
Meaning of Accountancy
Book-keeping and Accounting
Accounting Process
Objectives for accounting
Differences between book-keeping and accounting
Users of accounting information
Limitations of Accounting
Basic terminologies

[2] ACCOUNTING CONCEPTS, PRINCIPLES, BASES AND POLICIES

Introduction
Accounting Concepts
Principles
Policies and Standards
Types of accounting concepts
Business Separate entity concept
Going concern concept
Money measurement concept
Periodicity concept
Accrual concept
Accounting Principles
Principle of Income recognition
Principle of expense
Principle of matching cost and revenue
Principle of Historical costs
Principle of full disclosure

Double aspect principle
Modifying Principle
Principle of materiality
Principle of consistency
Principle of conservatism or prudence
Accounting Policies
Changes in Accounting Policies
Disclosure in case of changes in Accounting Policies
Accounting Standards
Scope and functions of Accounting Standards Board
International Financial Reporting System

[3] DOUBLE ENTRY ACCOUNTING

Introduction
Meaning of double entry accounting
Classification of accounts under Traditional approach
Classification of accounts under Accounting Equation approach
Comparison of traditional approach with Modern approach equal approach
Accounting Trail
Transactions and events
Meaning and roles of debit and credit
Accounting equation

[4] SECONDARY BOOKS

Introduction
Secondary books
Purchases Book/Purchases Day book
Cash discount, Trade discount
Difference between cash discount and trade discount, Sales Book or Sales Day book
Purchase Returns Book
Sales Returns Book
Bills receivable book
Bills payable book
Cash book
Posting to Ledger accounts

[5] TRIAL BALANCE

Introduction
Meaning
Objectives of preparing a trial balance
Methods of preparing a trial balance
Preparation of Trial balance
Adjusting Entries
Errors and their rectification
Errors disclosed by Trial Balance
Errors not disclosed by Trial Balance
Steps to locate the errors

[6] FINAL ACCOUNTS

Introduction
Adjustments before preparing final accounts
Depreciation
Bad Debts and accounting treatment of bad debts
Provision for doubtful debts
Reserves for Discount on Debtors
Reserve for Discount on Creditors
Closing Stock
Trading Account
Profit and Loss Account
Balance Sheet

[7] INTRODUCTION TO MANAGEMENT ACCOUNTING

Introduction
Meaning of Management accounting
The Role of Management Accounting
Management Accounting Framework
Functions of Management Accounting
Tools of Management Accounting
The Balanced Scorecard
Cost Management System
Value Added Concept
Merits of Management Accounting
Demerits of Management Accounting
Distinction between Management Accounting and Financial Accounting

[8] FINANCIAL STATEMENT ANALYSIS

Introduction
Meaning of Ratio
Steps in Ratio Analysis
Classification of Ratios
Du Pont Chart
Solved Problems
Advantages of Ratio Analysis
Limitation of Ratio analysis

[9] CASH FLOW ANALYSIS

Introduction
Meaning of Cash Flow Statement
Purpose of Cash Flow Statement
Preparation of Cash Flow Statement
Format of Cash Flow Statement (AS3: Revised Method)
Cash Flow from Operating Activities
Cash Flow Statement under Direct Method
Different between Cash Flow Analysis and Fund Flow Analysis
Uses of Cash Flow Statement

[10] MARGINAL COSTING AND BREAK EVEN ANALYSIS

Introduction
Concept of Marginal Costing
Characteristics of Marginal Costing
Difference between Absorption Costing and Marginal Costing
Marginal Cost
Contribution
Cost Volume Profit (CVP) Analysis
Break Even Chart
Break Even Point
Profit Volume ratio or MCSR
Target profit
Margin of Safety
Application of Marginal cost
Limitations of Marginal cost
Solved Problems

[11] BASICS OF FINANCIAL MANAGEMENT

Introduction of Financial Management
Objectives of financial management
Role of finance manager
Functions of financial management
Concept of time value of money
Present value
Future value
Annuity concept
Solved problems

TERM WORK

Students will be required submit assignment based on the topics covered in the syllabus such as ratio analysis for a company, calculation of breakeven point for a product, time value of money

LEARNING OUTCOME

After completion of this course students will be able to understand

- Concepts and principles of accounting, double-entry bookkeeping, limitations and objectives of accounting.
- Process of accounting
- Balance sheet, profit & loss statement, cash flow statement, and contents of an annual report.
- Breakeven point, marginal cost and breakeven analysis
- Concepts of time value of money, present value, future value, annuity, growing annuity, and perpetuity.

TEXT / REFERENCE BOOKS

1) Bhattacharya, S. K.; Dearden, J. *Accounting for Management – Text book & cases*; Vikash Publishing House: New Delhi, 2009.
2) Kishore, R. M. *Advanced Management Accounting*; Taxman: New Delhi, 2018.
3) Arora, M. N. *A Text Book of Cost Accountancy*; Vikas Publishing: Mumbai, 2010.
4) Horngren, C. T.; Foster, S. M.; Datar, G. *Cost Accounting – A Managerial Emphasis*; Prentice Hall: New Jersey, 1997.
5) Prasad, N. K.; A.K. Prasad *Cost Accounting*; Book Syndicate: Kolkata, 2016.
6) Edmonds, T. P.; Edmonds, C. D.; Tsay, B,-Y *Fundamental Managerial Accounting Concept*; Irwin McGraw Hill: Boston, 2013.
7) Bhattacharya, A. *Principles and Practice of Cost Accounting*; Sultan Chand: New Delhi, 2004.
8) Pillai, R. S. N.; Bhagavati, V. *Cost and Management Accounting*; Sultan Chand: New Delhi, 2010.
9) Banerjee, B. *Cost Accounting – Theory & Practices;* Sultan Chand: New Delhi, 2014.
10) Saxena V. K.; Vashist, C. D. *Advanced Cost & Management Accounting – Problems & Solutions*; Prentice Hall of India: New Delhi, 2015.
11) Maheshwari, S. N. *Studies in Cost Management*; Sultan Chand & Sons: New Delhi, 2013.
12) Rao, M. E. T. *Cost and Management Accounting*; New Age International: New Delhi 2004.
13) Rao, M. E. T.*Management Accounting*; New Age International: New Delhi 2003.

(CI308) LINEAR ELECTRONICS - I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To offer a detail understanding of the basic physical structure, principles of operation, electrical characteristics and circuit models of semiconductor devices like, various diodes, BJT, FET and fabrication of integrated-circuits.

DETAILED SYLLABUS

[1] JUNCTION DIODE CHARACTERISTICS

The Temperature Dependence of the V/I Characteristics, Diode Resistance, Space- Charge, or Transition Capacitance C_T, Charge controlled Description, Diffusion Capacitance, Junction-Diode Switching Times, Breakdown Diodes, Tunnel Diodes, Sampling gate.

[2] BIPOLAR TRANSISTOR CHARACTERISTICS

The Junction Transistor, Transistor Current Components, The Transistor as an Amplifier, Transistor Construction, The Common-Base (CB) Configuration, The Common-Emitter (CE) Configuration, The CE Cutoff Region, Currents, The CE Saturation Region, Typical Transistor-Junction Voltage Values, Common-Emitter Current Gain, Common Collector Configuration, Inverted Mode of Operation, Transistor Ratings, Additional Transistor Characteristics, Transistor Switching Times.

[3] TRANSISTOR BIASING AND THERMAL STABILIZATION

The Operating Point of a BJT, Bias Stability, Self-Bias or Emitter Bias, Stabilization against variations in Ico, VBE and, β, Bias Compensation, Biasing Technique for Linear Integrated Circuits, Thermistor & Sensistor Compensation.

[4] FREQUENCY RESPONSE OF AMPLIFIERS

Transistor Hybrid Model, The h Parameters, Conversion Formula For The Parameters of the Three Transistor Configurations, Analysis of Transistor Amplifier Circuit Using h Parameters, The Emitter Follower, Comparison of Transistor Amplifier Configurations, Miller's Theorem and its Dual, The Hybrid Pi Common Emitter Transistor Model at high Frequency, Hybrid Pi Conductance's, Hybrid Pi Capacitances, Validity of Hybrid Pi Model, Variation of Hybrid Pi Parameters, The CE Shot Circuited Current Gain, Current Gain with Resistive Load, Single Stage CE Transistor Amplifier Response, The Gain Bandwidth Product, Emitter Follower At High Frequency, Step Response of an Amplifier, Band pass of Cascaded Stages.

[5] INTEGRATED-CIRCUITS: FABRICATION AND CHARACTERISTICS

Integrated Circuit (Microelectronic) Technology, Basic Monolithic Integrated Circuits, Epitaxial Growth, Masking and Etching, Diffusion of Impurities, Transistors for Monolithic Circuits, Monolithic Diodes, The Metal Semiconductor Contact, Integrated Resistors, Integrated Capacitors, Characteristics of Integrated Components.

[6] FIELD-EFFECT TRANSISTORS

Construction & characteristics of JFETs, Transfer characteristics, Depletion type MOSFET, Enhancement-type MOSFET, MOSFET Handling, VMOS, CMOS, JFET biasing circuits, Depletion-type MOSFET biasing circuits, Enhancement-type MOSFET biasing circuits, FET Small signal model, AC analysis of different types of biased FET amplifiers.

LEARNING OUTCOMES

At the completion of the course, students will be able to…

- Analyze and design circuits containing elements such as diodes, BJTs, and FETs for small signal at low and high frequency.
- Design a biasing circuit for BJT with respect to stability aspect.
- Understand basic idea of fabrication and characteristics of integrated circuits.

TEXT / REFERENCE BOOKS

1) Integrated Electronics, Jacob Millman & Christos C. Halkias, 1st Edition, Tata McGraw Hill
2) Electronic Devices &Circuit Theory, Robert L. Boylstead & Louis Nashelsky, 8th Edition, Prentice Hall of India.
3) Integrated Circuits, K. R. Botkar, 9th Edition, Khanna Publications

(EC302) ELECTRONIC INSTRUMENTATION

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To offer profound understanding of operating principles, working and applications of various instruments for measurement of electrical parameters with reference to electrical & electronic systems.

DETAILED SYLLABUS

[1] DIRECT-CURRENT INDICATING INSTRUMENTS

Suspension Galvanometer, Torque and Deflection of the Galvanometer, Permanent-Magnet Moving Coil Mechanism, DC Ammeters, DC Voltmeters, Voltmeter Sensitivity, Voltmeter-Ammeter Method of Measuring Resistance, Series-Type Ohmmeter Shunt-Type Ohmmeter, Multimeter or VOM, Calibration of DC Instruments, Alternating-Current Indicating Instruments, Thermo Instruments, Electrodynamometers in Power Measurements Watt-hour Meter, Power-Factor Meter, Instrument Transformers.

[2] BRIDGES AND THEIR APPLICATION

Introduction, Wheatstone Bridge, Kelvin Bridge, Guarded Wheatstone Bridge, AC Bridges and their Application, Comparison Bridges, Maxwell Bridge, Hay Bridge, Schering Bridge, Unbalance Conditions, Wien Bridge, Wagner Ground Connection, Potentiometer.

[3] ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS

Amplified DC Meter, AC Voltmeter using Rectifiers, True RMS- Responding Voltmeter, Electronic Multimeter, Considerations in Choosing an Analog Voltmeter, Differential Voltmeters, Digital Voltmeters, Component Measuring Instruments, Q Meter, Vector Impedance Meter, Vector Voltmeter, RF Power and Voltage Measurement.

[4] OSCILLOSCOPES

Introduction, Oscilloscope, Block Diagram, Cathode Ray Tube, CRT Circuits, Vertical Deflection System, Delay Line, Multiple Trace, Horizontal Deflection System, Oscilloscope Probes and Transducers, Oscilloscope Techniques, Special Oscilloscopes.

[5] CONTROL ACTIONS AND CONTROLLERS

Control Actions like P, PI, PD & PID, Electronic Controllers, Characteristics of Different types of Control Valves.

[6] INDUSTRIAL INSTRUMENTATION

Measurement Schemes for Temperature, Pressure, Level & Flow with their Industrial Applications, Distributed Control System (DCS), and Programmable Logic Controller.

LEARNING OUTCOMES

At the completion of course, students will be able to ...

- Opt for the most appropriate instrument, in terms of input impedance, sensitivity, resolution, accuracy and precision for the measurement of the electrical parameters such as voltage, current, resistance, capacitance, inductance, frequency and phase difference.
- Operate CRO, DSO, Digital Multimeter and LCR meter for the measurement and analysis of the relevant parameters.
- Design the AC and DC Bridge Networks for the measurement of resistances, inductances, capacitances, permittivity of a dielectric material, etc.
- Understand the operating principle and working of electro dynamo meter based instruments for analysis of AC signal.
- Apply different measurement schemes for variety of control parameters such as temperature, fluid level, flow and pressure, frequently explored in the design of the control system.
- Recognize the utilities of automatic control systems such as PLC and DCS in the industry.

TEXT / REFERENCE BOOKS

1) Electrical & Electronic Measurement & Measuring Instruments, A. K. Sawhney, 17th Edition, Dhanpat Rai & Co.
2) Electronic Instrumentation and Measurement Technique, Wlliam D. Cooper & Albert D. Helfrick, 5th Edition , Prentice Hall of India
3) Electronics Measurement & Instrumentation, R. K. Rajput, 1st Edition, Prentice Hall of India
4) Electronic Instrumentation, H. S. Kalsi, 2nd Edition, Tata McGraw Hill

(EL304) NETWORK ANALYSIS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To inculcate capability to analyze electrical networks by understanding basic laws, theorems and transforms.

DETAILED SYLLABUS

[1] DEVELOPMENT OF THE CIRCUIT CONCEPT
Introduction, Charge and Energy, The Relationship of Field and Circuit Concepts, The Capacitance Parameter, The Inductance Parameter, The Resistance Parameter, Units and scaling, Approximation of a Physical System as a circuit

[2] CONVENTIONS FOR DESCRIBING NETWORKS
Reference Directions for Current and Voltage, Active Element Conventions, the Dot Convention for Coupled Circuits, Topological Description of Networks

[3] NETWORK EQUATIONS
Kirchhoff's Laws, The Number of Network Equations, Source Transformations, Examples of the Formulation of Network Equations Loop Variable Analysis, Node Variable Analysis, Determinants: Minors and the Gauss Method, Duality, State Variable Analysis.

[4] FIRST ORDER DIFFERENTIAL EQUATIONS
General & particular solutions, Time constants, integrating factor, More Complicated Networks

[5] INITIAL CONDITIONS IN NETWORKS
Why Study Initial Conditions? Initial Conditions in Elements, Geometrical Interpretation of Derivatives, A Procedure for Evaluating Initial Conditions, Initial State of a Network

[6] DIFFERENTIAL EQUATIONS (CONTINUED)
Second order equations ;Internal Excitation, Higher order equations ;Internal Excitation, Networks Excited by External Energy Sources, Response as related to the s-Plane Location of Roots, General Solutions in terms of S,Q and ω_n

[7] THE LAPLACE TRNASFORMATION
The Laplace Transformation, Some Basic Theorems for the Laplace Transformation, Examples of the solution of problems with the Laplace Transformation, Partial Fraction Expansion, Heaviside's Expansion Theorem, Examples of Solutions by the Laplace Transformation

[8] TRANSFORMS OF SPECIAL SIGNAL WAVEFORMS
The Shifted Unit-Step Function, The Ramp & impulse Functions, Waveform Synthesis, The Initial & Final Value of f(t) from F(s), The Convolution Integral, Convolution as Summation.

[9] IMPEDANCE FUNCTIONS AND NETWORK THEOREMS

The concept of Complex Frequency, Transform Impedance and Transform Circuits, Series and Parallel Combinations of Elements, Superposition and Reciprocity, Thevenin's Theorem and Norton's Theorem

[10] NETWORK FUNCTIONS: POLES AND ZEROS

Terminal Pairs or Ports, Network Functions for One Port and Two port. The Calculation of Network Function (1)Ladder Networks (2) General Networks, Poles and Zeros of Network Functions, Restrictions on Pole and Zero Locations for Driving-Point Functions, Restrictions on Pole and Zero locations for Transfer Functions, Time-domain Behaviour from the Pole & zero plot

[11] TWO PORT NETWORKS

Relationship of two port variables, short circuit admittance parameters, the open circuit impedance parameters, transmission parameters, the hybrid parameters, relationship between parameter sets, parallel connection of two port networks.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand Transient and Steady state behaviour of basic circuit elements- R, L, C.
- Apply various Network Theorems to simplify complicated networks and finding response of the same.
- Represent and analyse networks by differential equations and Laplace transforms.
- Determine two port network parameters and their relationships.
- Understand the concept of transform impedance, transform admittance and transfer Functions.
- Represent any real time signals in terms of the standard waveforms for easy conversion in frequency domain.
- Apply the techniques and skills to face and succeed in competitive examinations like GATE.

TEXT / REFERENCE BOOKS

1) Network Analysis, M.E. Van Valkenburg, 3rd Edition, Prentice Hall of India Private Limited
2) Network Analysis and Synthesis, U. A. Patel, 3rd Edition, Mahajan Publication House.
3) Circuit Theory - Analysis & Synthesis, A. Chakraborty, 1st Edition, Dhanpatrai publication

(IC302) DIGITAL ELECTRONICS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES

- To understand basic components of digital logic design and characteristics of logic gates.
- To analyze behavior of logic families.
- To apply circuit minimization techniques and their use in designing combinational and sequential circuits.
- To understand PLDs and their applications.
- To design and implement basic combinational and sequential circuits using EDA tool.

DETAILED SYLLABUS

[1] INTRODUCTION TO LOGIC CIRCUITS
Logic Gates & Networks, Truth Tables, Boolean Algebra, Synthesis using AND, OR and NOT Gates, NAND – NOR Logic Networks, Sum of Products and Product of Sums Forms, Introduction to Verilog.

[2] IMPLEMETATION TECHNOLOGY
Transistor Switches, nMOS& CMOS Logic Gates, Negative Logic Systems, Introduction to PAL, PLA, CPLD & FPGAs, MOSFET Fabrication, Voltage Levels in Logic Gates, Noise Margin, Dynamic Operation & Power Dissipation in Logic Gates, Fan-in and Fan-out, Transmission Gates, Transistor-Transistor Logic, Emitter - Coupled Logic.

[3] OPTIMIZED IMPLEMENTATION OF LOGIC FUNCTIONS
Karnaugh Map Strategy for Minimization, Minimization of POS Forms, Multiple Output Circuits, Multilevel Synthesis, Analysis of Multilevel Synthesis.

[4] COMBINATIONAL CIRCUITS
Multiplexers, Decoders, Encoders, Code Converters, Arithmetic Comparison Circuits

[5] SEQUENCIAL CIRCUITS
Basic Latch, Gated SR Latch, Gated D Latch, Master Slave & Edge Triggered D Flip-Flops, T & JK Flip Flops, Registers, Counters, Reset Synchronization, BCD- Ring –Johnson Counters.

[6] SYNCHRONOUS SEQUENCIAL CIRCUITS
Basic Design Steps, Mealy State Model, Design of Counter, FSM as an Arbiter Circuit, Analysis of Synchronous Sequential Circuits.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand different types of basic components of digital systems.

- Select appropriate logic family as per need of the digital design.
- Identify the need of PLDs and their applications.
- Apply circuit minimization techniques.
- Evaluate sequential circuit design.
- Design finite state machines with their types and flow for practical digital circuits.

TEXT / REFERENCE BOOKS

1) Fundamentals of Digital Logic with Verilog Design, Stephen Brown & Zvonko Vrenesic, Tata McGraw Hill
2) Digital Logic and Computer Design, Morris Mano, Prentice Hall of India
3) Fundamental of Digital Circuits, Anand Kumar, Prentice Hall of India

(EC303) MATHEMATICAL COMPUTING LABORATORY

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	0	0	25	25	50	0	0	1	1

OBJECTIVES

- To give students visualization of the mathematical concepts in their core engineering subjects to help them understand the concepts effectively.
- Inclusion of simulations on the applied problems will help the students' interest in other subjects.

DETAILED SYLLABUS

Introduction to Python, Functions, Looping and plotting with Python.

Simulations programs based on AC analysis of circuit, Power factor calculations, Matrix operations, Linear equations solving using matrix operations, Fourier Series, Limit and Partial derivative solutions and KCL and KVL application on network circuits are included.

LEARNING OUTCOMES

- To apply mathematical concepts and principles to perform computations
- To understand application of mathematics in solving Electronics engineering related problems.
- Create, use and analyze graphical representations of mathematical relationships
- To use technological tools like SCILAB/PYTHON to solve mathematical Equations.

(AF411) MATHEMATICS - IV

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	0	0	100	4	0	0	4

OBJECTIVES

- Ability to analyze and solve problems in both familiar and unfamiliar situations including those in real-life contexts with better accuracy.
- Able to apply knowledge of key theories, concepts, tools and techniques of Mathematics to solve structured and unstructured Engineering problems.
- Understand and be able to use the language, symbols and notation of mathematics
- Use different forms of mathematical representation (formulae, diagrams, tables, charts, graphs and models)
- Generate and/or analyze information, find relationships and patterns, describe these mathematically as general rules, and justify or prove them.

DETAILED SYLLABUS

[1] FUNCTIONS OF COMPLEX VARIABLE

Analytic functions, Cauchy -Riemann equations, Harmonic functions, orthogonal system, complex potential function, Determination of conjugate function, conformal transformation, some standard transformations, bilinear transformation, line integral, properties of complex integration, Cauchy's theorem and Cauchy's integral formula.

[2] NUMERICAL METHOD

Solutionofalgebraicandtranscendentalequations,byNewton-Raphsonmethod, Direct iteration method, false position method, Solution of linear simultaneous equation: (1) Gauss-elimination (2) Gauss-jordan (3) Gauss-siedal method, Numerical methods to solve first order and first degree ordinary differential equations by Picard's method & Taylor's series method, Modified Euler's Method, Milne's Method, Runge's method, Runge kutta method.

[3] FINITE DIFFERENCES & DIFFERENCE EQUATIONS

Finite difference, Interpolation, Newton's forward and backward and central differences and Lagrange's formula, Sterling & Bessel's formula, Numerical differentiation & Integration, Trapezoidal rule, Simpson's (both) rules, Difference equations with constant coefficient.

[4] VECTOR CALCULUS

Vector function of a single scalar variable, Differentiation of vectors, simple applications to plane, motion, scalar and vector point functions, Del applied to scalar point function (gradient) Divergence of a vector point function, curl of a vector, second order expressions, line integrals, surface integrals, Green’s theorem, Gauss theorem and stoke's theorem.

[5] STATISTICAL METHODS

Binomial distribution, Poisson distribution, normal distribution, calculation of errors, probable errors, standard error, coefficient of correlation, lines of regression.

LEARNING OUTCOMES

- Able to apply the method of solving linear system of equations, linear transformation and Eigen value problem as they arise, for instance from electrical networks, framework in mechanics, curve fitting, other optimization problems and processes in statistics.
- Proficient to apply the theory and concepts of vector differential calculus and vector integral calculus in problems related to fluid flow, heat flow, electro static and so on.
- Understanding concept of Complex numbers and Complex functions and able to check the analyticity based on Cauchy-Riemann equations.
- Able to evaluate the complex integration and real integrals of practical interest.
- Able to interpolate and extrapolate the data with the help of numerical methods.
- Able to handle data numerically or graphically, in order to see what properties data have and what kind of information we can extract and if data influenced by chance student may apply the concepts and rules of probability theory.

TEXT / REFERENCE BOOKS

1) Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication
2) A Text Book of Applied Mathematics, P. N. & J. N. Wartikar & Chandrika Prasad, Pune Vidyarthi Grih Prakashan

(CL418) LINEAR ELECTRONICS - II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To offer in-depth understanding of the analysis, design, and applications for analog electronics circuits.

DETAILED SYLLABUS

[1] P0WER CIRCUITS AND SYSTEMS

Amplifier Classification, Distortion in Amplifiers, Large-Signal Amplifiers, Harmonic Distortion, Efficiency of a Class A Amplifier, Push-Pull Amplifiers, Class B amplifiers, Class AB Operation, Regulated Power Supplies, Series Voltage Regulator.

[2] FEEBACK AMPLIFIER CHARACTERISTIC

Classification of Amplifiers, The Feedback Concept, The Transfer Gain with Feedback, General Characteristics of Negative-Feedback Amplifiers, Input Resistance, Output Resistance, Method Analysis of a Feedback Amplifier, Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback.

[3] OSCILLATORS USING TRANSISTOR

Sinusoidal Oscillators, The Phase-Shift Oscillators, Resonant-Circuit Oscillators, A General Form of Oscillator Circuits, Colpitt's Oscillator, Hartley's Oscillator, Clapp's Oscillator, Crystal Oscillators.

[4] OPERATIONAL AMPLIFIER CHARACTERISTICS

Differential Amplifier, DC and AC Analysis of Bipolar Differential Amplifier, The ideal Operational Amplifier, Inverting and Non-Inverting Amplifiers, Op-Amp Parameters, Measurement of Op-Amp Parameters, General Description of Various Stages of Op-Amp, Open-Loop and Closed-Loop Frequency Response, Op-Amp Stability, Frequency Compensation.

[5] LINEAR APPLICATIONS OF OP-AMP

Summing and Difference Amplifiers, Integrator and Differentiator, Current-to-Voltage Converters, Voltage-to-Current Converters, Current Amplifiers, Voltmeters and Current Meters, Instrumentation Amplifiers, Transducer Bridge Amplifiers, Ideal and Realistic Frequency Response of Various Filters, Basic First-Order Low-Pass and High-Pass Filters, First Order Wideband Band Pass Filters (Phase-Shifter), Second-Order Low-Pass Filters, Second-Order High-Pass Filters, Second-Order Band-Pass Filters, Second-Order Band-Reject Filters.

[6] NON-LINEAR APPLICATIONS OF OP-AMP

Precision Half-Wave Rectifiers, Precision Full Wave Rectifiers, Log Amplifiers, Antilog Amplifiers, Zero Crossing Detector, Level Detectors, Voltage Magnitude Comparator and Window Detector, Basic Peak Detectors Using Op-Amps and Comparators, Basic Sample and Hold Circuits, Digital to Analog (D/A) Converters, Analog to Digital (A/D) Converters.

[7] WAVESHAPING & WAVEFORM GENERATORS

The Op-Amp as Voltage Comparator, Some Applications of a Comparator using Op-Amp, Schmitt Trigger Circuit, Basic Triangular Wave Generator, Astable and Monostable Multivibrator Using Op-Amp, Introduction to 555 Timer, Timer 555 Used in Astable and Monostable Mode.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand the fundamentals and datasheet parameters of Op – Amp and 555 Timer.
- Analyze linear, non-linear, Voltage regulators, and waveform generating applications using Op – Amp, BJT and 555 Timer.
- Demonstrate feedback amplifiers and wave shaping circuits.
- Design linear, non-linear, Voltage regulators, and waveform generating applications using Op – Amp, BJT and 555 Timer.

TEXT / REFERENCE BOOKS

1) Integrated Electronics, Millman & Halkians, Tata McGraw Hill
2) Op - Amp and Linear Integrated Circuits, Ramakant A. Gayakwad, 4th Edition, Pearson Education
3) Integrated Circuits, K. R. Botkar, 9th Edition, Khanna Publications

(EC404) OBJECT ORIENTED PROGRAMMING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To make students familiar with the difference between object-oriented programming and procedural programming. In addition, the student should acquire skills for programming using advanced C++ features such as composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.

DETAILED SYLLABUS

[1] INTRODUCTION
Comparison of C & C++, OOP Concepts, OOP Concepts (cont.), Introduction to Programming in C ++ & Features, Input Output Operations using cin & cout.

[2] DATA TYPES AND OPERATORS
Data types & Operators.

[3] LOOPS AND DECISIONS
Branching Operations in C++, Looping Operations in C++.

[4] FUNCTIONS
Simple Functions, Passing Arguments & Returning Values from Functions, Function Overloading in C++, Default Arguments.

[5] OBJECTS AND CLASSES
Comparison of Structure and Class, Concept of Classes and Objects, Concept of Constructor & Destructor, Passing and Returning Objects, Static Data Members and Functions.

[6] ARRAYS
Arrays in C++ including String as an Array of Characters, Array of Objects & Array within a Class.

[7] OPERATOR OVERLOADING
Operator Overloading of Unary Operator, Operator Overloading of Binary Operator, Conversion from Basic to User Defined, Conversion from User Defined to Basic & User Defined to User.

[8] INHERITANCE
Inheritance Defined, Concept of Inheritance, Single Inheritance, Derived Class Constructor, Function Overriding, Hierarchical & Multilevel Inheritance, Multiple Inheritance, and Constructor in Multiple Inheritance.

[9] POINTERS
Introduction to Pointers & Pointer to an Object, Pointers & Arrays, Pointers & Functions, Memory Management using New & Delete, Pointer to a Pointer.

[10] VIRTUAL FUNCTIONS

Friend Function, Member Function as Friend and Friend Class, Overloading of = and [ ] (Array Index) Operator, Containership, This pointer, Hybrid Inheritance, Virtual Base Class, Virtual Functions, Dynamic Binding, Introduction to Stream Classes, Basic File Operations, Handling of File Pointers & Command Line Arguments.

[11] HARDWARE INTERFACING

Study of Parallel Port Registers, *inportb( )* and *outportb ( )* Function Calls, Programming Parallel port of a PC, LED & Relay interfacing with a PC, Project Development, Serial port interfacing basics.

[12] TEMPLATES & EXCEPTION HANDLING

Template Programming, Study of Various Exception Classes, Exception Handling Mechanisms, Generation of Exceptions.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- To develop object oriented program using control structures, modularity, I/O, file operations and other standard language constructs for problem solving.
- Demonstrate adeptness of object oriented programming using data abstraction, encapsulation, and inheritance.
- Utilize polymorphism to solve big computing problems.
- Implement programming solutions using other features of the C++ language including templates, exceptions, forms of casting and conversions.

TEXT / REFERENCE BOOKS

1) Programming with ANSI C++, Bhushan Trivedi, Oxford Press.
2) Object Oriented Programming in Turbo C++, Robert Lafore, Galgotia Publications
3) Let us C++, Yashwant Kanetkar, BPB Publications

(CI416) ELECTRICAL MACHINES & POWER

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To expose the students to the concepts of various types of electrical machines and their applications. Besides to introduce with the fundamental of generation, transmission and distribution of the electrical power and power system protection.

DETAILED SYLLABUS

PART-I ELECTRICAL MACHINES

[1] DC MACHINES

DC Generator & DC Motor

Operating Principle and Types, Losses in DC Generator, Power Stages in DC Generator, Maximum Efficiency and Power in DC Generator, Generator Characteristics.

[2] AC MACHINES

Single Phase Transformer

Working Principle, Construction, Characteristics of an Ideal Transformer, EMF Equation, Transformer Load Analysis, Transformer Parameters, Equivalent Circuit, Open Circuit & Short Circuit Tests, Efficiency, Regulation, Concepts of Auto-transformer.

Three Phase Transformer

Working Principle, Types of Connections.

Three Phase Induction Motors

Working Principle, Construction, Relation between Torque & Rotor Power Factor, Starting Torque and Running Torque of Motor, Effect of Change in Supply Voltage on Starting Torque, Torque Slip Characteristics, Induction Motor as a Generator, Power Stages, Linear Induction Motor, Starting Methods of Induction Motor.

Single Phase Motors

Introduction and Broad Classifications, Double Field Revolving Theory, Self-Starting Mechanism, AC Series Motor and Universal Motors.

Alternators

Working Principle, Construction, Factors Affecting Alternator Size, Alternator on Load, Synchronous Reactance, Vector Diagrams, Voltage Regulation by EMF Method, Parallel Operation of Alternators.

PART–II ELECTRICAL POWER

[1] POWER STATIONS

Schematic Arrangement of Various Power Plants - Thermal, Hydro, Nuclear, Diesel and Gas Turbine Based Power Plant, Structure of Electric Power System, Load Curves, Important Terms and Factors, Load Duration Curves, Types of Loads.

[2] POWER FACTOR IMPROVEMENT

Power Triangle, Disadvantages and Causes of Low Power Factor, KVAR Calculations, Importance of Power Factor Improvement, Most Economical Power Factor.

[4] TRANSMISSION LINE & UNDER GROUND CABLES

Classification of Transmission Line & Under Ground Cables, Main Components, Conductor Materials, Types of Insulators, String Efficiency and Its Improvement, Performance of Short Transmission Line. Construction of Cables.

[5] INTRODUCTION TO SWITCH GEAR

Essential Features of Switchgear, Switchgear Equipment - Circuit Breaker, Fuses, Relay, Principle and Methods of *arc* Quenching in Circuit Breaker, Desirable Characteristics of Fuse Element, Fuse Element Materials, Types of Fuses, Theory of Protective Relays, Fundamental Requirements of Protective Relay, Calculation of Relay Operating Time, The Bus Bar Arrangement, Faults in Power System.

[6] PROTECTION OF ALTERNATORS & TRANSFORMERS

Differential Protection of Alternators, Buchholz Relay, Earth-Fault Protection of Transformer.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand constructional details, principles of operation, performance, starter and speed control of DC / AC machines.
- Analyse the efficiency of any electrical machine.
- Compare various power stations. Identify the need for various units involved in the power plants and to understand their rated specifications.
- Represent elements of switch gear and other systems related to the generation, transmission and distribution of electrical power.
- Understand significance of power factor and to apply methods for resolving related issues.

TEXT / REFERENCE BOOKS

1) Electrical Technology (Vol: II), B. L. Theraja & A. K. Theraja, 23rd Edition, S. Chand & Company Ltd.
2) Principles of Power System, V. K. Mehta & Rohit Mehta, 4th Edition, S. Chand & Company Ltd.
3) Theory and Performance of Electrical Machine, V.B. Gupta, 13th Edition, Laxmi Publications
4) Electrical Engineering, R.K. Rajput, 1st Edition, Laxmi Publications
5) Course in Power System, J. B. Gupta, 10th Edition, S. K. Kataria & Sons.
6) Switchgear and Protection, J. B. Gupta, 2nd Edition, S. K. Kataria & Sons.

(EC406) CMOS VLSI DESIGN

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To offer a profound understanding of the design, computer aided simulations and physical verification for complex digital VLSI circuits.

DETAILED SYLLABUS

[1] OVERVIEW OF VLSI
Complexity and Design, Basic Concepts, Types of IC, VLSI Design Flow.

[2] LOGIC DESIGN WITH MOSFETS
MOSFET as a Switching Element, Basic and Complex Logic Gates in CMOS, Transmission Gate Circuits, Clocking and Dataflow Control.

[3] FABRICATION OF CMOS INTEGRATED CIRCUITS
Physical Structure of CMOS Integrated Circuits, CMOS Patterning – Silicon Layout and Stick Diagrams, Fabrication of CMOS Integrated Circuits – Process Flow and Design Rules, Layout of Basic Structures, FET Sizing.

[4] ELECTRICAL CHARACTERISTICS OF CMOS LOGIC
MOS Physics, FET RC Model, DC and Transient Characteristics of CMOS Gates, Power Dissipation, Analysis of Complex Logic Gates.

[5] DESIGNING HIGH SPEED CMOS LOGIC NETWORKS
Driving Large Capacitive Loads, Delays Estimate for Logic Cascade, Delay Optimization Using Logical Effort, Branching Effort, Advanced Techniques in CMOS Logic Circuits.

[6] ADVANCED CMOS CIRCUITS
BiCMOS Drivers, Mirror Circuits, Pseudo-nMOS, Tri-state Circuits, Clocked CMOS, Dynamic CMOS Logic Circuits, Domino Logic Cell Dual-Rail Logic Networks. (DCVSL, CPL)

[7] THE DESIGN OF VLSI SYSTEM
Memories and Programmable Logic, Interconnect Delay Modelling, Crosstalk, Interconnect Scaling, Floor Planning and Routing, Input and Output Circuits, Power Distribution and Consumption, Low Power Design Considerations, VLSI Clocking and System Design, Reliability and Testing of VLSI Circuits.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Implement digital logic using CMOS.

- Generate and examine the Silicon Layout for various digital logic.
- Assess and describe the factors leading to failure of a fabricated logic.
- Demonstrate appropriate use of various switching elements for effective solution in terms of Power, Speed or Area.
- Interpret and quantitatively determine behaviour of a CMOS digital logic.
- Identify various hazards and timing problems and other issues related with digital system design and possible solutions.
- Determine appropriate test vectors for detection of logical fault in digital logic.

TEXT / REFERENCE BOOKS

1) Introduction to VLSI Circuits& Systems, John P. Uyemura, John Wiley & Sons Inc..
2) CMOS logic Circuit Design, John P. Uyemura, Springer Private limited
3) Digital Integrated Circuits - A Design Perspective, J.M. Rambaey, A. Chandrakassan & B. Nikolic, 2nd Edition, Prentice Hall of India.
4) Principles of CMOS VLSI Design - A System Perspective, N. H. E. Weste & K. Eshraghian, 2nd Edition, Prentice Hall of India.
5) Modern VLSI design - System On Chip Design, W. Wolf, 3rd Edition, Pearson Asia

(EL405) APPLIED MATHEMATICS LABORATORY

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	0	0	25	25	50	0	0	1	1

OBJECTIVE

- The fundamental aim of the applied mathematics is to provide a structure for students to combine their knowledge in mathematics and an interest in a specific engineering activity. The student after undergoing this course will be able to solve problems in engineering domain related to Linear Algebra using matrices, Laplace Transform and Fourier Series.

DETAILED SYLLABUS

Introduction to Scilab, Simulation programs based on Numerical methods, Correlation, Convolution, Discrete Fourier Transform, Differential equation solutions, Probability and system analysis.

LEARNING OUTCOMES

- To apply mathematical concepts and principles to perform computations.
- To understand application of mathematics in solving Electronics engineering related problems.
- Create, use and analyze graphical representations of mathematical relationships
- To use technological tools like SCILAB to solve mathematical Equations.

(EC407) AUDIO VIDEO ENGINEERING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	0	0	25	25	50	0	0	1	1

OBJECTIVES

- To understand and verify the functioning of a Television (TV) Transmitter and Receiver with its supporting instruments.
- To learn functioning of various audio-video technologies.

DETAILED SYLLABUS

Picture Transmission, Sound Transmission, Monochrome and Color Television Receiver, RF Section, VIF Section, Composite Video Signal Dimensions, Interlaced and Progressive Scanning, Pattern Generator, Color Picture Signal Formation, Color Difference Signal, Vectroscope, Construction and Characteristics of Microphones, Construction and Characteristics of Loudspeakers, Audio Addressing System, Audio Mixer, LCD TV, LED TV, Plasma TV, HDTV, DTH.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Acquire the basic knowledge about TV Transmitter and Receiver.
- Study various aspects of TV signal.
- Operate TV kit, Vectroscope and Pattern Generator.
- Understand internal structure and functioning of various types of Microphones, Loudspeakers.
- Implement Audio Addressing Circuit.
- Know about working of TV technologies like LCD, LED and Plasma.
- Get information about TV transmission technologies and various audio video formats.

TEXT / REFERENCE BOOKS

1) Modern Television Practice, R. R. Gulati, New age international publisher
2) Audio and Video Systems, R. G. Gupta, Technical education series.

(AF501) PROFESSIONAL COMMUNICATION - I

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
1	0	2	50	0	0	50	100	1	0	1	2

OBJECTIVES

- To develop confidence in the students for communicating at workplace.
- Develop their Listening, Speaking, Reading, and Writing Skills.
- To give exposure of communicating with public.
- How to develop fluency in English Language.
- To prepare students for placement.
- To teach how to be effective at the job.

DETAILED SYLLABUS

[1] INTRODUCTION TO PROFESSIONAL COMMUNICATION

Importance
Methods and Manners
Need of Professional Communication
Objectives of Professional Communication
Skills required for Professional Communication
Employers' Expectations

[2] COMMUNICATION AND BARRIERS

Introduction
Process
Principles
Components
Types of Communication
Main problems of Communication
Verbal Communication
- Oral Communication
- Written Communication
- Advantages of Verbal Communication
- Limitations of Verbal Communication

Non-Verbal Communication
- Importance of Non-Verbal
- Kinesics
- Proxemics
- Chronemics
- Haptics
- Oculesics
- Paralanguage

Barriers of Communication
- Intrapersonal
- Inter-Personal
- Organizational

Noises in Channel

- Physical
- Semantic
- Psychological
- Physiological

[3] LANGUAGE PROFICIENCY

Introduction
Basic Grammar Rule
Vocabulary Building
Language Games

LEARNING OUTCOMES

After completion of this course students will be able to understand

- Communication Process and framework
- Obstacles in Communication
- Possible remedies to barriers of communication
- Effective Listening, Reading, Writing and speaking skills
- Implementation of Non-Verbal features in the presentation
- Ways and manners Presentations, Speech, Group talk and Interview
- Competence in writing and reading

TEXT / REFERENCE BOOKS

1) Meenakshi Raman, Sangeeta Sharma. *Technical Communication*: *Principles and Practice*; Oxford University press: New Delhi, 2004.
2) Meenakshi Raman, Prakash Singh. *Business Communication: Second edition;* Oxford University Press: New Delhi, 2012.
3) Steve Hart, Arvind R. Nair, VeenaBhambhani. *Embark: English for Undergraduates;* Cambridge University Press: Delhi, 2016.
4) T M Farhathullah. *Communication Skills for Technical Students;* Orient Longman Private Ltd.: Chennai, 2002.

(EC511) MICROCONTROLLER & APPLICATIONS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To develop in-depth understanding of operations, assembly language programming and interfacing techniques related to 8051 microcontroller.

DETAILED SYLLABUS

[1] MICROPROCESSORS AND MICROCONTROLLERS
Introduction, Microprocessors and Microcontrollers, The Z80 and the 8085, A Microcontroller survey, Development systems for Microcontrollers.

[2] THE 8051 ARCHITECTURE
Introduction, 8051 Microcontroller Hardware, Input/Output pins, ports and circuits, External memory, Counter and timers, Serial data input/output, Interrupts.

[3] MOVING DATA
Introduction, Addressing Modes, External data moves, Code memory read only data moves, Push and Pop, Data exchanges.

[4] LOGICAL OPERATIONS
Introduction, Byte-level & Bit-level logical operations, Rotate and Swap operations.

[5] ARITHMETIC OPERATIONS
Introduction, Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal arithmetic.

[6] JUMP AND CALL INSTRUCTIONS
Introduction, The jump and call program range, Jump types, Call and Subroutines, Interrupts and Returns, Enabling, Disability & Priority in interrupts.

[7] AN 8051 MICROCONTROLLER DESIGN
Introduction, A Microcontroller specification, A Microcontroller Design, Testing the design, Subroutines, Lookup tables for the 8051, Serial data transmission.

[8] APPLICATIONS
Introduction, Keyboards, Displays, Pulse Measurement, D/A & A/D conversions, Case Study.

[9] SERIAL DATA COMMUNICATION
Serial I/O Modes of Operation, serial data input output programming.

[10] 8006/97 OVERVIEW
8096/97 (16-bit Microcontroller) Architecture overview and additional features.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Write and execute assembly language program for given application.
- Determine the execution time and memory occupancy of a given program.
- Interface microcontroller with several input/output peripherals for the given application.
- Understand internal architecture of other microcontrollers by referring their reference manuals.
- Select an appropriate microcontroller for the particular application.
- Develop microcontroller based applications, which can be commercialized and useful to the nation.

TEXT / REFERENCE BOOKS

1) The 8051 Microcontroller based Embedded Systems, Manish K. Patel, McGraw Hill Education.
2) The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J Ayala,2nd Edition, Penram International Publication.
3) The 8051 Microcontroller & Embedded Systems, Muhammad A. Mazidi & Janice G. Mazidi, 2nd Edition, Pearson Education

(EC512) ELECTRONIC COMMUNICATION

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To offer in-depth understanding of various aspects of Analog Communication systems, Satellite Communication and Optical Communication.

DETAILED SYLLABUS

[1] RESONANT CIRCUITS
Series and Parallel Equivalence, Series RLC Circuit, Parallel Tuned Circuit, Skin Effect, Mutual Inductance, Coupling Circuits.

[2] WAVEFORM SPECTRA
Introduction, Complex Repetitive Waves, Effect of Filtering on Complex Signals.

[3] NOISE
Introduction, Thermal Noise, Shot Noise, Partition Noise, Low- Frequency or Flicker Noise, High frequency or Transmit Time Noise, Generation Recombination Noise, Equivalent Noise Resistance, Signal to Noise Ratio, Noise Factor, Noise Temperature.

[4] RF AMPLIFIERS
Tuned RF Amplifiers, Neutralization, Special RF Amplifiers, Frequency Conversion and Mixers.

[5] RECEIVERS
Introduction, Super heterodyne Receivers, Choice of Intermediate and Oscillator Frequencies, Image Rejection, Adjacent Channel Selectivity, Spurious Responses, Tracking Automatic Gain Control, Double Conversion Receivers, HF Communications Receivers.

[6] AMPLITUDE MODULATION
Introduction, Amplitude Modulation, Amplitude Modulated Transmitters, AM Receivers

[7] SINGLE-SIDEBAND MODULATION
Introduction, Single Sideband Principles, The Balanced Modulator SSB Generation, SSB Reception, Modified SSB Systems.

[8] ANGLE MODULATION
Introduction, Frequency Modulation, Phase Modulation, Equivalence between FM and PM, Angle Modulator Circuits, Angle Modulation Detectors.

[9] SATELLITE COMMUNICATION
Introduction, Orbits, Station Keeping, Satellite Attitude, Transmission Path, Path Loss, Noise Considerations, The Satellite System, Saturation Flux Density, Effective Isotropic Radiated

Power, Antenna Look Angles, Elevation and azimuth angle calculations, Uplink and down link power budget calculations, Multiple Access Methods.

[10] FIBER OPTIC COMMUNICATIONS

Introduction, principles of Light Transmission in Fiber, Losses in Fiber, Dispersion, Light Sources for Fiber Optics Photo Detectors, Connectors and Splices, Fiber Optic Communication Systems.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Describe parameters like resonant frequency, bandwidth, gain etc. related about RF amplifier.
- Analyse and express signal in time domain as well as frequency domain.
- Understand concepts of Satellite and Optical Communication.
- Implement different blocks of analog transmitter and receiver.
- Analyse effect of noise in Analog Communication Systems.
- Design Amplitude modulator/demodulator and Angle modulator/demodulator circuits.

TEXT / REFERENCE BOOKS

1) Electronic Communication, Dennis Roddy & John Coolen, 3rd Edition, Prentice Hall of India.
2) Electronic Communications, George Kennedy, 4th Edition, Tata McGraw Hill

(EC517) ELECTROMAGNETIC FIELDS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	1	0	60	40	50	00	150	4	1	0	5

OBJECTIVE

- To inculcate the strong foundation of the static as well as time varying electromagnetic fields, to help the students identify, formulate and solve the problems related to electromagnetic fields and wave propagation.

DETAILED SYLLABUS

[1] VECTOR ANALYSIS
Scalars and Vectors, Vector Algebra, The Cartesian coordinate system, Vector Components and Unit Vectors, The Vector Field, The Dot Product, The Cross Product, Other Coordinate Systems; Circular Cylindrical Coordinates, The Spherical Coordinate System.

[2] COULOMB'S LAW AND ELECTRIC FIELD INTENSITY
The Experimental Law of Coulomb, Electric Field Intensity, Field Due to a Continuous Volume Charge Distribution, Field of a Sheet of Charge, Streamlines and Sketches of Fields.

[3] ELECTRIC FLUX DENSITY, GAUSS'S LAW, AND DIVERGENCE
Electric Flux Density, Gauss's Law, Application of Gauss's Law Some Symmetrical Charge, Distributions, Application of Gauss's Law, Differential Volume Element, Divergence, Maxwell's First Equation (Electrostatics), The Vector Operator V and the Divergence Theorem.

[4] ENERGY AND POTENTIAL
Energy Expended in Moving a Point Charge in an Electric Field, The Line Integral, Definition of Potential Difference and Potential, The Potential Field of a Point Charge, The Potential Field of a System of Charges, Conservative Property, Potential Gradient, The Dipole, Energy Density in the Electrostatic Field.

[5] CONDUCTORS, DIELECTRICS, AND CAPACITANCE
Current and Current Density, Continuity of Current, Metallic Conductors, Conductor Properties and Boundary Conditions, The Method of Images, Semiconductors, The Nature of Dielectric Materials, Boundary Conditions for Perfect Dielectric Materials, Capacitance, Several Capacitance Examples, Capacitance of a Two-Wire Line.

[6] POISSON'S AND LAPLACE'S EQUATIONS
Poisson's and Laplace's Equations, Uniqueness Theorem, Examples of the Solution of Laplace's Equation, Example of the Solution of Poisson's Equation, Product Solution of Laplace's Equation.

[7] THE STEADY MAGNETIC FIELD
Biot-Savart Law, Ampere's Circuital Law, Curl, Stokes' Theorem, Magnetic Flux and Magnetic Flux Density, The Scalar and Vector Magnetic potential, Derivation of Steady- Magnetic.

[8] MAGNETIC FORCES, MATERIALS AND INDUCTANCE

Force on a Moving Charge, Force on a Differential Current Element, Force between Differential Current Elements, Force and Torque on a closed Circuit, The Nature of Magnetic Materials, Magnetization and Permeability, Magnetic Boundary Conditions, The Magnetic Circuit, Potential Energy and Forces on Magnetic Materials, Inductance and Mutual Inductance.

[9] TIME-VARYING FIELDS AND MAXWELL'S EQUATIONS

Faraday's Law, Displacement Current, Maxwell's Equations in Point Form, Maxwell's Equations in Integral Form, The Retarded Potentials.

[10] THE UNIFORM PLANE

Wave Motion in Free Space, Wave Motion in Perfect Dielectrics, Plane Waves in Lossy Dielectrics, The Poynting Vector and Power Considerations, Propagation in Good Conductors: Skin Effect, Reflection of Uniform Plane Waves, Standing-Wave Ratio.

[11] TRANSMISSION LINES

Basic Principles, Reflection co-efficient, Transmission co-efficient, Equation of the impedance on the transmission line.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand & create substantial transition from circuit theory to field theory.
- Evaluate the problems in different EM fields.
- Apply the Maxwell's Equations for solving the electrostatic and magneto static Systems.
- Understand and analysis the moving charges on magnetic fields.
- Initiate the design of a range of field theory applications such as transmission line, antennas, wave propagation so on.

TEXT / REFERENCE BOOKS

1) Engineering Electromagnetics, William H. Hayt, 7th Edition, Tata McGraw Hill
2) Electronic Communication Systems, George Kenedy, 3rd Edition, Tata McGraw Hill
3) Theory and Problems in Electromagnetics, Joseph Edminister, Tata McGraw Hill
4) Principles of Electromagnetics, Mathew N.O. Sadiku, 3rd Edition, Oxford University Press
5) Electromagnetics, John D. Kraus, 3rd Edition, Tata McGraw Hill

(EC519) TERM PROJECT (ELECTRONIC CIRCUITS)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	00	00	50	00	50	0	0	1	1

OBJECTIVE

- To make students capable to apply and synthesize knowledge acquired in theories by implementation of hardware based projects.

LEARNING OUTCOMES

At the completion of course, Students will be able to …

- Plan, design and implement hardware projects.
- Analyze and interpret output.
- Explore skills to function on multi-disciplinary teams.
- Identify, formulate, and solve engineering problems
- To use the techniques, skills, and modern engineering tools necessary for engineering practice.
- Designing of PCB and implement hardware on PCB.

(EC518) CONTROL THEORY

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To prepare students to have knowledge of various types of control systems characteristics, Transfer function of any control system with different techniques and mathematical model for physical systems, various stability criteria, define system specifications in time and frequency domain, identify stable/unstable systems and relative/ marginally stable systems, various time and frequency domain stability analysis techniques, time-frequency domain concepts, calculate system specifications and solve control problems.

DETAILED SYLLABUS

[1] INTRODUCTION

Open-loop and closed loop control system, Servomechanism, Historical development of control system, sampled data & digital control system, Multivariable control system, Application in non-engineering field.

[2] MATHEMATICAL MODELS OF PHYSICAL SYSTEMS

Introduction, Differential equation of physical systems, Transfer functions, Block diagram algebra, signal flow graph. (Note: Problems on electrical, mechanical & electromechanical systems only.)

[3] FEEDBACK CHARACTERISTICS OF CONTROL SYSTEMS

Feedback and non feedback systems, reduction of parameter variations by use of feedback, control over system dynamics by use of feedback, effects of disturbance signals by use of feedback, lineraizing effect of feedback, regenerative feedback, Basics of Feed forward Control System with example.

[4] TIME RESPONSE ALALYSIS AND CONCEPTS OF STABILITY

Introduction, standard test signals, time response of first order system, time response of second order system, steady state errors and error constants, effects of adding zero to a system, design specifications and constructions for second and higher order systems, performance indices, examples, concepts and conditions for stability, Huwitz's and Routh's stability criteria, relative stability criteria.

[5] THE ROOT LOCUS TECHNIQUE

Introduction, Rules of construction of root loci, sketching of root locus and applications

[6] FREQUENCY DOMAIN ANALYSIS & STABILITY

Freq. domain specifications, correlation bet time & frequency domain specifications, Bode plot, Polar plot, Nichols chart, Nyquist stability criterion, Constant M& N circles

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Judge the best stable system by implementing the various techniques.
- Analyze LTI Systems using various stability analysis techniques in time and frequency domain.
- Solve control system problems based on system specifications requirements
- Design and analyze the physical system using various mathematical models.

TEXT / REFERENCE BOOKS

1) Feedback Control Systems, D. K. Theckedath , R. A. Barapate, Tech-Max Publication.
2) Control System Engineering, U. A. Patel, Mahajan Publication House.
3) Modern Control Engineering, K. Ogata, 4th Edition, Prentice Hall of India

(EC507) POWER ELECTRONICS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To prepare students for analysis and designing power converter circuits for different power applications by offering deep insight into characteristics and functioning of various power semiconductor devices.

DETAILED SYLLABUS

[1] INTRODUCTION TO POWER ELECTRONICS

Overview of Power Electronics, Power Semiconductor Devices, Control Characteristics of Power Devices, Characteristic & Specifications of Switches, Types of Power Circuits, Reverse Recovery Characteristics, Types of Power Diodes, Freewheeling Diodes, Structure and Volt-Current Characteristics of Power MOSFETS, COOLMOS, SITs, Structure and Volt-Current Characteristics of IGBTs, SiC – MOSFET, SiC – IGBT.

[2] THYRISTORS

Thyristor Characteristics, Two Transistor Model of Thyristor, Thyristor Turn-on, Thyristor Turn-off, Types of Thyristors, Series & Parallel Connection of Thyristors, di/dt& dv/dt Protection, Gate Drive Circuits.

[3] UNCONTROLLED AND CONTROLLED RECTIFIERS

Multiphase Star Rectifiers, Three-Phase Bridge Rectifiers, Three-Phase Bridge Rectifier With RL Load, 3-Phase Rectifier Design, Principal of Phase Controlled Converter, Single Phase Semi Converter, Single Phase Full Converter, Three Phase Half Wave Converters, Three Phase Semi Converter, Three Phase Full Converter. (Without Analysis for RL Load), Power Factor Improvement, Pulse Width Modulation using IGBT, Single Phase Sinusoidal PWM using IGBT, Three Phase PWM Control using IGBT.

[4] INVERTERS

Principal of Operation of Pulse Width Modulated Inverters, Performance Parameters, Single-Phase Bridge Inverters, Voltage Control of Single-Phase Inverters, Current Source Inverter, Multilevel Concept, Applications & Features of Multilevel Inverter.

[5] DC-DC CONVERTERS

Principal of Step Down Converter, Principal of Step Up Converter, Performance Parameters, Converter Classification, Switch Mode Buck, Boost, Buck-Boost & Cuk Regulators, Chopper Circuit Design.

[6] AC CONTROLLERS

Principal of On-Off Control, Principal of Phase Control, Cyclo-converters, PWM Controlled AC Voltage Controllers.

[7] PROTECTION OF DEVICES & CIRCUITS
Cooling and Heat Sinks, Snubber Circuits, Reverse Recovery Transients, Supply & Load Side Transients, Current & Voltage Protection, Magnetic Interference, Protection of IGBT

[8] DC DRIVES
Characteristics of DC Motor, Operating Modes, Single-Phase DC Drives, Breaking Schemes of DC-DC Converter Drives, Closed-Loop Control of DC Drives.

[9] AC DRIVES
Induction Motor Drives, Close-Loop Control of Induction Motors, Synchronous Motor Drives, Stepper Motor Control, Basics of DC Drives and Comparison with AC Drives.

[10] POWER SUPPLIES
Switched-Mode Power Supplies, UPS, CVT.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Acquire knowledge about fundamental concepts and techniques used in power electronics.
- Understand the behavior of different power semiconductor components.
- Design and analyze various power converter circuits in power applications.
- Identify basic requirements for power electronics-based applications.
- Build and troubleshoot power electronics circuits.
- Understand the use of power converters in commercial and industrial applications.

TEXT / REFERENCE BOOKS

1) Power Electronics circuits, Devices and Applications, Muhammad H. Rashid, 3rd Edition, Pearson Education and PHI.
2) Power Electronics, M. D. Singh and K. B. Khanchandani, 2nd Edition, The McGrow Hill.
3) Power Electronics, Dr. P.S.Bhimbhara, 4th Edition, Khanna Publication.
4) Power Electronics, B. R. Gupta & V. Singhal, 2nd Edition, S. K. Kataria & Sons

(AF601) PROFESSIONAL COMMUNICATION – II

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
1	0	2	50	0	0	50	100	1	0	1	2

OBJECTIVES

- To develop confidence in the students for communicating at workplace.
- Develop their Listening, Speaking, Reading, and Writing Skills.
- To give exposure of communicating with public.
- How to develop fluency in English Language.
- To prepare students for placement.
- To teach how to be effective at the job.

DETAILED SYLLABUS

[1] COMMUNICATION SKILLS

Intrapersonal Communication
Interpersonal Communication
Importance of Empathy in Communication
Psychological Dealings in Communication
Positive Attitude

[2] TEAM BUILDING

Introduction
Meaning and importance of team
Skills and qualities of a team member
Techniques to be a good team member
Working in Groups
Leadership Qualities
Negotiation Skills
Adjustment level and Flexibility
Understanding Teammates

[3] EFFECTIVE SELF PRESENTATION THROUGH LSRW

Listening
active listening
Speaking
Indianism
Presentation
Reading
Speed Reading
Reading Practice
Levels of Comprehension (Evaluative and Applied)
Comprehension practice
Writing
Minutes

Notice
Proposal
Report Writing

LEARNING OUTCOMES

After completion of this course students will be able to understand …

- Psychological aspects in communication
- Developing Positive Attitude and empathy
- Importance of team and how to work in a team
- Effective Listening, Reading, Writing and speaking skills
- Corporate Communication
- Writing Minutes, Notice, Proposal and Report
- Competence in writing and reading

TEXT / REFERENCE BOOKS

1) Meenakshi Raman, Sangeeta Sharma. *Technical Communication*: *Principles and Practice*; Oxford University press: New Delhi, 2004.
2) Meenakshi Raman, Prakash Singh. *Business Communication: Second edition;* Oxford University Press: New Delhi, 2012.
3) Steve Hart, Arvind R. Nair, VeenaBhambhani. *Embark: English for Undergraduates;* Cambridge University Press: Delhi, 2016.
4) T M Farhathullah. *Communication Skills for Technical Students;* Orient Longman Private Ltd.: Chennai, 2002.

(EC615) ADVANCED MICROPROCESSORS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES

- To understand basics of microprocessors.
- To offer a detailed understanding of the 8086 as well as ARM7 architecture and hardware specifications.
- To develop assembly language programs for data processing using 8086 and ARM7 instructions.
- To apply interfacing techniques to design basic x86 based hardware systems.
- To be familiar with features of advanced microprocessors like Pentium.

DETAILED SYLLABUS

[1] THE MICROPROCESSOR AND ITS ARCHITECTURE
Internal Architecture, Real mode memory addressing, protected mode memory addressing, memory paging.

[2] ADDRESSING MODES
Data addressing mode, program memory addressing mode, stack memory addressing mode

[3] 8086/8088 HARDWARE SPECIFICATIONS
Pin-outs, pin functions, clock generator, bus buffering and latching, bus timing, ready and the wait state, minimum mode versus maximum mode.

[4] MEMORY INTERFACE
Memory devices, address decoding, 8086 and 8088 memory interface

[5] INTERRUPTS
Basic interrupt processing, Hardware interrupts, Expanding the interrupt structure

[6] THE PENTIUM MICROPROCESSOR
Protected mode, paging mode, virtual 8086 mode, memory management mode with Pentium.

[7] INTRODUCTION TO ARM
Overview of ARM Processor, Fundamental of RISC & CISC, Evolution of RISC, Comparison of RISC & CISC, Design for LPC.

[8] ARM ARCHITECTURE
Architectural inheritance, Programmer's model, ARM development tools, Software Assembler (ARM), 'C' Language Complier, Simulator, Hardware Board, Board organization, Communication with external world. 3-stage pipeline ARM organization, ARM instruction execution, ARM implementation.

[9] ARM ASSEMBLY LANGUAGE PROGRAMMING
Data processing instructions, Data transfer instructions, Control flow instructions, Programs

based on assembly language. Introduction, Exceptions, Conditional execution, Branch and Branch with Link (B, BL), Branch, Branch with Link and eXchange (BX, BLX), Software Interrupt (SWI), Data processing instructions, Multiply instructions, Count leading zeros (CLZ), Single word and unsigned byte data transfer instructions, Half-word and signed byte data transfer instructions, Multiple register transfer instructions, Swap memory and register instructions (SWP), Status register to general register transfer instructions, General register to status register transfer instructions, Coprocessor instructions.

[10] THE THUMB INSTRUCTION SET

The Thumb bit in the Current Program Status Register (CPSR), The Thumb programmer's model, Thumb branch instructions, Thumb software interrupt instruction, Thumb data processing instructions, Thumb single register data transfer instructions, Thumb multiple register data transfer instructions, Thumb breakpoint instruction, Thumb implementation, Thumb applications.

[11] INTRODUCTION TO VECTORED INTERRUPT CONTROLLER

IRQ and FIQ using Vectored interrupt controller of LPC23xx

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- understand x86 and ARM7 architectures and program development tools
- develop assembly language programs of 8086 and ARM7 microcontrollers
- interface memory systems with 8086
- develop interrupt service routines of 8086 and ARM7 based microcontrollers

TEXT / REFERENCE BOOKS

1) The Intel Microprocessors 8086, 8088, 80186, 80188, 80286, 80386, 80486, Pentium, Pentium Pro Processors, Berry B Brey, 6th Edition, Prentice Hall of India.
2) ARM - System-On- Chip Architecture, Steve Furber, 2nd Edition, Prentice Hall of India.
3) Microprocessors and Interfacing-Programming & Hardware, Douglas V. Hall, 2nd Edition, Tata McGraw Hill.
4) IBM PC Assembly Language Programming, Peter Abel, 2nd Edition, Prentice Hall of India.
5) ARM System Developer Guide, Antrew Sloss, Dominic Symes, Chris Wright, Morgan Kaufmann.
6) Technical Ref. Manual, ARM7TDMI (3) UM10211 LPC 2364/66/68/78 User Manual, NXP Ltd.

(EC604) COMMUNICATION SYSTEMS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To offer a profound understanding of signal analysis, digital and analog modulation techniques and digital communication systems.

DETAILED SYLLABUS

[1] INTRODUCTION

Overview of Communication System, Analog and Digital messages, Signal-to-Noise Ratio (SNR), Channel Bandwidth, Rate of Communication, Modulation, Randomness, Redundancy, and Coding.

[2] ANALYSIS AND TRANSMISSION OF SIGNALS

Signal Analysis

Periodic signal representation by Fourier Series, Exponential representation of non-periodic signals, Fourier Transforms and its properties, Sampling theorem.

Signal Transmission

Distortion less transmission through a linear system, Signal distortion over a channel, Bandwidth and the rate of pulse transmission, Energy Spectral Density(ESD) of a signal, Power Spectral Density(PSD) of a signal.

[3] DIGITAL COMMUNICATION SYSTEMS

Conversion of analog signal to digital form: Pulse code and Delta modulation, Digital multiplexing, Line coding, Pulse shaping, Scrambling of data, The regenerative repeater, Detection error probability, M-ary communication, Digital carrier systems.

[4] DIGITAL MODULATION TECHNIQUES

Coherent Binary Phase Shift Keying, Coherent Binary Frequency Shift Keying, Coherent Qudra-Phase Shift Keying, Coherent Minimum Shift Keying, Non-Coherent Orthogonal Modulation, Non-Coherent Binary Frequency Shift Keying, Differential Phase Shift Keying, Comparison of Binary and Quaternary modulation schemes, M-ary modulation techniques.

[5] MODULATION

Amplitude (Linear) Modulation

Amplitude Modulation: Single Side Band (SSB) signal equation, Hilbert's Transform of a signal, Effects of frequency and phase errors in synchronous demodulation, Digital carrier systems, Interference and noise in AM systems, Frequency-Division Multiplexing.

Angle (Exponential) Modulation

Interference and Noise in Angle-Modulated systems, Stereo FM receiver.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand basic signals and systems, Fourier series and Fourier transform and their application in signal analysis.
- Understand and analyze various aspects of digital communication systems such as Pulse code and Delta modulation, Digital multiplexing, Line coding, Pulse shaping, Scrambling, Regenerative repeater, Detection error probability, M-ary communication, Digital carrier systems.
- Understand various digital modulation techniques and their advantages and disadvantages.
- Analyse and compare the effect of of noise and interference in analog modulation systems like SSB, DSB-SC, AM, FM and PM.

TEXT / REFERENCE BOOKS

1) Modern Digital and Analog Communication System, B. P. Lathi, 2nd Edition, Oxford Publication
2) Communication Systems, Simon Haykin, 3rd Edition, John wiley & sons.
3) Electronic Communication System-Fundamental through Advance, Tomas W., 3rd Edition, Wisley.
4) Communication System Analog & Digital, R. P. Singh, Tata Mc GrawHill.

(EC610) MICROWAVE & ANTENNAS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES

- To present a perceptive understanding of the fundamentals of a variety of antennas & the radio frequency networks.
- Further, nurturing the ability to design and analyze the performance of assorted antennas for wide range of operating frequency and microwave networks for various wired and wireless systems.

DETAILED SYLLABUS

[1] TRAMSMISSSION LINE
The Smith Chart & its Applications, Transmission Line Components.

[2] WAVEGUIDES, RESONATOR & COMPONENTS
Rectangular Waveguides, Circular and other Waveguides, Waveguide Coupling, Matching & Attenuation, Cavity Resonator, Auxiliary Components.

[3] MICROWAVE TUBES & CIRCUITS
Microwave Triodes, Multi-Cavity Klystron, Reflex Klystron, Magnetron, Travelling Wave Tube and other Microwave Tubes.

[4] SEMICONDUCTOR MICROWAVE DEVICES & CIRCUITS
Passive Microwave Circuits, Transistor & Integrated Circuits, Varactor and Step Recovery, Diodes and Multipliers, Parametric Amplifiers, Tunnel Diodes and Negative Resistance Amplifiers, Gunn Effect Diodes, Avalanche Effect and Diodes, other Microwave Diodes, Micro-strip Line.

[5] ANTENNAS
Basic Considerations, Radiation from the Hertz Dipole, Near and Far Field Analysis, Radiation Parameters of Antenna, Thin Linear Antenna, Effect of Ground on Antennas, Basic Antenna Parameters, Side Lobe Level of Antenna.

[6] ANTENNA ARRAYS
Array of Point Sources, Broad side & End Fire Array, Array Synthesis, Schelkunoff Zero Placement Method, Binomial Array, Folded dipole, Yagi-Uda Array, Log Periodic Dipole Array Antenna.

[7] SPECIAL ANTENNA
Directional High Frequency Antennas, Helical Antennas, Rhombic Antenna, Microwave Frequency Antennas, Horn Antennas, Parabolic Reflector Antenna.

[8] RADIATION AND PROPAGATION OF WAVES
Electromagnetic Radiation, Propagation of Waves, Ground, Space and Sky Wave Propagation, Scatter propagation, Duct propagation, Multi hop propagation, Fading and Diversity.

LEARNING OUTCOMES

At the completion of course, students will be able to...

- Develop a generalized technique to solve the network problems related to a range of transmission lines.
- Conceptualize the waveguide and propagation of diverse modes.
- Build their notion about the semiconductor devices used at RF.
- Figure-out a variety of the RF network parameters, such as characteristic impedance, standing wave ratio, reflection coefficient, VSWR, etc.
- Design the matching networks for the RF networks.
- Analyze performance of the RF networks.
- Gain the insight of the electromagnetic wave and wave theory.
- Categorize the antenna specifications required for designing.
- Classify antennas used in VHF/ UHF band.
- Compute the basic antenna parameters such as Gain, Efficiency, Directivity, etc.
- Understand the concept of the antenna arrays.
- Adopt antennas and antenna arrays as per the operating frequency/spectrum and/or the radiation pattern.
- Understand the different modes of wave propagation and effects of ground on the electromagnetic wave.

TEXT / REFERENCE BOOKS

1) Electromagnetic Waves, R. K. Shevgaonkar, Tata McGraw Hill.
2) Microwave Devices and Circuits, S. Y. Liao, 3rd Edition, Prentice Hall of India.
3) Electronic Communication systems, George Kennedy, 3rd Edition, Tata McGraw Hill.
4) Antennas, C. A. Balani, 3rd Edition, Tata McGraw Hill.
5) Antennas & Wave Propagation, K. D. Prasad, 2nd Edition, Khanna Publication.

(EC616) TERM PROJECT (MICROCONTROLLER)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	0	0	50	0	50	0	0	1	1

OBJECTIVE

- To offer a profound understanding and implementation of microcontroller based embedded systems in an elementary and integrated manner.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Plan, design and Implement a small scale embedded system.
- Interface Microcontroller(s) with other peripherals.
- Develop an Integrated (in terms of hardware and software) system to fulfil the requirements.
- Design PCB for hardware implementation.

(EC611) DIGITAL SIGNAL PROCESSING

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To offer in depth understanding of time domain and frequency domain analysis of discrete time signals and systems. To provide understanding of design of IIR and FIR digital filters.

DETAILED SYLLABUS

[1] INTRODUCTION
Signal and Signal Classification (Analog, Digital), Types of Signal Processing, Advantages and Disadvantages of DSP.

[2] DISCRETE SIGNALS
Operations on Discrete Signals, Decimation and Interpolation.

[3] DISCRETE TIME SYSTEMS
System Classification, Digital Filters-Difference Equation, Impulse Response, Stability, Connections.

[4] DISCRETE CONVOLUTION
Discrete Convolution, Convolution of Finite Sequences, Stability of LTI Systems, System Response to Periodic Inputs, Periodic Convolution, Discrete Correlation.

[5] THE Z-TRANSFORM
Definition, Properties, Z-Plane Representation, The Transfer Function, Inverse-Z Transform, System Analysis, Frequency Response.

[6] APPLICATIONS OF Z-TRANSFORM
Time Domain Analysis, Frequency Response - Graphical Interpretation, Application-Oriented Examples: Digital Audio Effects.

[7] IIR FILTER DESIGN
Introduction, IIR Filter Design, Response Matching, Matched-Z Transforms, Mappings, Bilinear Transformation.

[8] FIR FILTERS DESIGN
Linear Phase Requirement and Symmetric Sequences, FIR Design By Fourier Series & Windowing Method.

[9] THE DFT AND FFT
Fourier Series, Fourier Transform, DTFT, DFT - Definitions, Properties, Spectral Smoothing by Time Windows, The FFT, DIT- FFT, DIF-FFT, IDFT, Applications of Overlap-Add Method & Overlap - Save Method.

[10] ADVANCE DSP CONCEPTS

Multirate Signal Processing, Adaptive Signal Processing, Finite Word Length Effect.

[11] APPLICATIONS OF DSP

Speech Processing: Speech Analysis, Speech Synthesis, Speech Recognition, Speaker Recognition, Image Processing: Extracting The Edges, Blurring The Images, Biomedical Signal Processing: ECG Analysis, Noise Detection And Diagnosis.

[12] DSP PROCESSOR ARCHITECTURE

Introduction to Digital Signal Processors: Characteristics of DSP Algorithms and Hardware Requirements, Von Neumann Architecture, Harvard Architecture, Parallelism And Hardware Units of Typical Digital Signal Processor. Architectural Details of TMS320C6x.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand different Types of Discrete Signals and Operations like Shifting, Scaling, Decimation, Interpolations.
- Classify Digital Systems and Analyze Digital Systems with Z-Transform.
- Find Response of Discrete time LTI Systems.
- Design FIR and IIR Filters.
- Represent Discrete Time Signal in Frequency Domain through DFT and Calculate it by FFT Algorithms.
- Calculate Discrete Fourier Transform with FFT algorithms.
- Understand specialized features of DSP Processors.
- Explore Applications of DSP in the field of Image Processing, Biomedical and Sound Processing.

TEXT / REFERENCE BOOKS

1) Analog and Digital Signal Processing, Ashok Ambardar, 2nd Edition, Thomson Brooks-Cole.
2) Digital Signal Processing, G. Proakis & Dimitris G. Manolakis, 3rd Edition, Prentice Hall of India
3) Digital Filters- Analysis, Design and Applications, Andreas Antonion, 2nd Edition, Tata McGraw Hill.
4) Digital Signal Processing - A Computer Based Approach, Sanjit K Mitra, 3rd Edition, Tata McGraw Hill.

(EC617) AUTOMATED ELECTRONICS

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES

- To understand basic components of automation in Industries.
- To learn various industry automation techniques.
- To apply knowledge of automation components for practical applications.
- To study different systems based on PLC, SCADA and robots in automation.

DETAILED SYLLABUS

[1] INTRODUCTION
Automation overview, Architecture of Industrial Automation system, Introduction of PLC and supervisory control and data acquisition (SCADA), Industrial bus systems: Modbus & Profibus

[2] AUTOMATION COMPONENTS
Sensors for temperature, pressure, force, displacement, speed, flow, level, humidity and pH measurement. Actuators, process control valves, introduction of DC and AC servo drives for motion control.

[3] COMPUTER AIDED MEASUREMENT AND CONTROL SYSTEMS
Elements of computer aided measurement and control, man-machine interface, computer aided process control hardware, process related interfaces, Industrial communication systems, Data transfer techniques, Computer aided process control software, Computer based data acquisition system, Internet of things (IoT).

[4] PROGRAMMABLE LOGIC CONTROLLERS
Programmable controllers, Programmable logic controllers, Analog digital input and output modules, PLC programming, Ladder diagram, Sequential flowchart, PLC Communication and networking, PLC selection, PLC Installation, Application of PLC.

[5] DISTRIBUTED CONTROL SYSTEM
Overview of DCS, DCS software configuration, DCS communication, DCS Supervisory Computer Tasks, DCS integration with PLC and Computers.

[6] OVERVIEW OF INDUSTRIAL AUTOMATION USING ROBOTS
Basic construction and configuration of robot**,** Pick and place robot, Welding robot.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand various automation components and systems.
- Draw block diagram of industrial automation and control system.

- Explain architecture of industrial automation system and fundamentals of process control.
- Measure industrial parameters like temperature, pressure, force, displacement, speed, flow, level, humidity and pH.
- Use programmable logic controllers for industrial automation.
- Draw block diagram of supervisory control and data acquisition (SCADA).
- Integrate SCADA with PLC systems.
- Acquaint with the use of robot for industrial applications'

TEXT / REFERENCE BOOKS

1) Industrial Instrumentation and Control, S. K. Singh, 3rd Edition, Tata McGraw Hill Companies.
2) PC based Instrumentation –Concepts and practice, N. Mathivanan, 3rd Edition, PHI Publications.
3) Programming Logic Controllers -Principles and applications, John W. Webb & Ronald Reis, 5th Edition, PHI Publications.
4) Process Control Instrumentation Technology, C. D. Johnson, 8th Edition, PHI Publications.
5) Programmable logic controller, Dunning & Delmar, 3rd Edition, Thomas Dilmar Publications.
6) Industrial control handbook, Parr & Newman, 3rd Edition, Industry Press.

(EC720) IMAGE PROCESSING (ELECTIVE - I)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To provide fundamental knowledge of Digital Image Processing (DIP). Students are made familiar with various Image Processing techniques like Image Enhancement, Restoration, Segmentation, and Morphological Operations & Feature Extraction.

DETAILED SYLLABUS

[1] INTRODUCTION
Digital Image Processing, The Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

[2] DIGITAL IMAGE FUNDAMENTALS
Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

[3] IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN
Background, Some Basic Gray Level Transformations, Histogram Processing, Enhancement using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

[4] IMAGE ENHANCEMENT IN THE FREQUENCY DOMAIN
Background, Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Holomorphic Filtering, Implementation.

[5] IMAGE RESTORATION
A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Geometric Transformations.

[6] COLOR IMAGE PROCESSING
Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing.

[7] MORPHOLOGICAL IMAGE PROCESSING
Preliminaries. Dilation and Erosion. Opening and Closing. The Hit-or-Miss Transformation. Some Basic Morphological Algorithms. Extensions to Gray-Scale Images.

[8] IMAGE SEGMENTATION

Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds, The Use of Motion in Segmentation.

[9] REPRESENTATION AND DESCRIPTION

Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Relational Descriptors.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- To visualize a digital image in spatial domain and Frequency domain.
- To learn causes of image degradation and to implement various approaches for enhancing/restoring degraded images in spatial and frequency domain.
- To study various Thresholding & Edge detection approaches to binarize an image for object segmentation.
- To implement various feature extraction methods for representing and describing segmented object.
- To apply various morphological operations for shape detection of object.
- To understand various color models of a digital image.

TEXT / REFERENCE BOOKS

1) Digital Image Processing, Rafael C. Gonzalez& Woods, 3rd Edition, Wesley Publishing Co.
2) Image Processing, Don Pearson, Tata McGraw Hill
3) Digital Picture Processing, Azriel Resen feld, Avinash C. Kak, Academic Press, New York
4) Digital Image Processing, Kenneth R. Castleman, Pearson Education
5) Fundamental of Digital Image Processing, Anil K. Jain, Pearson Education

(EC724) BIOMEDICAL INSTRUMENTATION (ELECTIVE - I)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES

- To make the students aware about importance of different instruments in Medical field which are used for the measurement of different parameters of human body along with classification and terminologies of measurement Techniques.
- To teach the students about specifications, selection criteria and characteristics of instrumentation measurement systems of different Biomedical signals in Medical field.
- To teach the students about various Imaging techniques for different applications in biomedical field.

DETAILED SYLLABUS

[1] MEASUREMENT, RECORDING AND MONITORING

Fundamentals of Medical Instrumentation

Anatomy and Physiology, Physiological system of Body, Sources of Biomedical Signals, Basic Medical Instrumentation System, Performance requirement of Medical Instrument system, General Constraints of Medical Instrument system, **Regulations of Medical Devices**

Bioelectric signals and Electrodes:

Origin of Bioelectric signals, Recording Electrodes, Electrodes for ECG,EEG,EMG, Electrical conductivity of electrodes jellies and creams, Microelectrodes, Skin surface electrodes and needle electrodes

Recording systems:

Basic recording system, General considerations for signal conditioners, Preamplifiers, Sources of noise in low level measurement, Biomedical signal analysis techniques, Signal processing techniques, The main amplifier and driver stage, Different types of recorders, VCG,PCG,EEG,EMG,ECG

Patient monitoring Systems:

System concepts, Cardiac monitor, Bedside Patient Monitoring system, Central Monitors, Measurement of Heart Rate, Measurement of Blood Flow, Measurement of Pulse Rate, Blood Pressure Measurement, Measurement of Temperature, Measurement of Respiration rate, Cauterizations lab instrumentation

[2] MODERN IMAGING SYSTEMS

X-Ray Machines and Digital Radiography:

X-Rays, X-Rays Machine, X-Ray Computed Tomography, Nuclear Medical Imaging Systems, Emission Computed Tomography (ECT),Single Photon Emission Computed Tomography (SPECT),Positron Emission Tomography (PET), Magnetic Resonance

Imaging (MRI) Ultrasonic Imaging Systems:

Diagnostic Ultrasound, Physics of Ultrasonic waves, Medical Ultrasound, Basic Pulse echo apparatus, A- scan, Echocardiograph, Real time Ultrasonic Imaging Systems, Biological effects of ultrasound

[3] THERAPEUTIC EQUIPMENT

Cardiac Pacemakers:

Need for Cardiac Pacemakers, External Pacemakers, Implantable Pacemakers, Recent Development in Pacemakers

Cardiac Defibrillators:

Need for Cardiac defibrillator, DC Defibrillator, Implantable Defibrillator, Pacer-Cardioverter Defibrillator

Instruments for Surgery:

Surgical Diathermy, Surgical Diathermy Machine, Safety aspects in Surgical Diathermy machine, Surgical Diathermy Analyzers

LASER Application in Biomedical Engineering:

What is LASER?, Different types of LASER, Effects of Tissues and related issues, Selection of LASER for surgery, Application in different areas, Safety Aspects

Physiotherapy and Electrotherapy Equipment:

Shortwave Diathermy, Microwave Diathermy, Ultrasonic Diathermy, Pain relief through Electrical Stimulation Hemodialysis machine:

Function of Kidneys, Artificial Kidneys, Dialyzer, Hemodialysis machine

Electrical Safety of Medical Equipment:

Physiological effect of electrical current, Shock hazard form electric equipment, **Methods of accident prevention Latest Issues in BME:**

Biomaterials, Telemedicine, Artificial heart

LEARNING OUTCOMES

After successful completion of this course, student shall be able to …

- develop awareness about needs of different biomedical instruments for measuring different bioelectric signals along with their design-development, classification and associated technical terminologies.
- learn specifications and salient characteristics-based choice making of biomedical instrumentation measurement systems
- learn methods and applications in the field of Biomedical instrumentation. Develop awareness of measuring different body parameters and acquired the knowledge about its importance for body with the help of different biomedical instruments.

TEXT / REFERENCE BOOKS

1) Hand book of Biomedical Instrumentation, Gerd Kaiser, 3rd Edition, McGraw Hill Publication
2) Biomedical Instrumentation and measurement, Cromwell, Pearson Publication
3) Introduction to Biomaterials, Sujata Bhatt, Narosa Publication
4) Introduction to Biomedical Equipment Technology, Joseph Carr, Pearson Publication
5) Biomedical Digital signal Processors, Wills J. Tompkins, Pearson Publication
6) Medical Instrumentation- Application and Design, John G. Webster, Wiley Publication

(EC725) ADVANCED DIGITAL SIGNAL PROCESSING (ELECTIVE - I)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES

- To offer understanding of advancements in digital signal processing in the area of adaptive filters, multirate signal processing, transforms and specialized processors in addition to understanding of various issues related to finite word length effects.
- The course also includes review of the fundamentals to facilitate the students to understand advance topics.

DETAILED SYLLABUS

[1] OVERVIEW
Discrete Time Signals, Discrete Time Systems, z-transfrom, DFT, FFT, IIR design methods, FIR design methods

[2] DIGITAL FILTERS
Filter structures for IIR and FIR filters, direct form I and II, parallel and cascade forms, Lattice

[3] FINITE WORD-LENGTH EFFECTS IN DIGITAL FILTERS
fixed and floating point representation of numbers, quantization noise in signal representations, finite word-length effects in coefficient representation, round-off noise, SQNR computation and limit cycle

[4] MULTI-RATE SIGNAL PROCESSING
decimation and interpolation; poly-phase decomposition; digital filter banks: Nyquist filters, two channel quadrature mirror filter bank and perfect reconstruction filter banks, sub-band coding

[5] OPTIMAL AND ADAPTIVE FILTERING
Minimum mean square error and linear minimum mean square error criteria, FIR Wiener filter and linear prediction, steepest descent algorithm and LMS algorithm. Applications: Adaptive Modelling and System Identification, Inverse Adaptive Modelling, Deconvolution, Adaptive Inverse Control, Adaptive Interference Cancelling

[6] POWER SPECTRAL ANALYSIS AND APPLICATIONS
[7] HILBERT TRANSFORMS AND APPLICATIONS
[8] WAVLET TRANSFORMS AND APPLICATIONS

[9] INTRODUCTION TO DIGITAL SIGNAL PROCESSORS
Characteristics of DSP algorithms and hardware requirements, von Neumann architecture, Harvard architecture, parallelism and hardware units of typical digital signal processor. Architectural details of TMS320C6x.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Analyze Digital filters with z-Transform.
- Design and implement FIR and IIR Filters.
- Calculate Discrete Fourier Transform with FFT algorithms.
- Understand advance concepts of adaptive filters and specialized features of DSP Processors.
- Differentiate DFT, z transform, Hilbert transform and wavelet transform
- Explore Applications of DSP in the field of wireless communication, Image Processing, multirate signal processing and power spectrum estimation

TEXT / REFERENCE BOOKS

1) Digital Signal Processing, J.G. Proakis and D. G. Manolakis, 3rd Edition, Prentice Hall of India
2) Discrete-Time Signal Processing, A. V. Oppenheim and R. W. Shafer, 2nd Edition, Prentice Hall of India.
3) Digital Signal Processing: A computer- Based Approach, S. K. Mitra, 2nd Edition, Tata McGraw Hill
4) Analog and Digital Signal Processing, Ashok Ambardar, 1st Edition, THOMSON Brooks.
5) Adaptive Filter Theory, Simon Haykin, 4th Edition, Prentice Hall of India.
6) Digital Signal Processing a practical Approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Prentice Hall of India.

(EC702) DATA & COMPUTER COMMUNICATIONS (ELECTIVE - IV)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To teach basic knowledge of networking technology, network architecture and major communication protocols of Internet architecture.

DETAILED SYLLABUS

[1] INTRODUCTION
The uses of Computer Networks, Network Structure, Network Architecture, OSI Reference Model, Classification of Computer Networks, TCP/IP Protocol Suite, Connectionless Vs Connection Oriented Services, Services & Interface.

[2] THE MEDIUM ACCESS SUBLAYER
The Channel Allocation Problem, Multiple Access Protocols, Collision Free Protocols, IEEE Standard 802.x for LAN and MANs, Bridges.

[3] THE DATA LINK LAYER
Data Link Layer Design Issues, Elementary Data Link Protocols, Sliding Window Protocols.

[4] THE NETWORK LAYER
IPv4 Addressing, Special Addresses, Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Internetworking, Internetworking Devices, The Network Layer in Internet - ARP, IP and ICMP Network Layer Protocols.

[5] THE TRANSPORT LAYER
The Transport Services, Elements of Transport Protocols, The Internet Transport Protocols (TCP and UDP).

[6] THE APPLICATION LAYER
Network Security

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Identify and describe different networking technologies.
- Understand the layering concepts in computer networks and to analyze the functions of each layer.
- Contrast the protocol architectures such as OSI and TCP/IP.
- Be familiar with network protocol programming.
- Demonstrate the use of utilities for network debugging in a laboratory environment.
- Interpret and quantitatively determine the specifications of cabling and networking components.
- Determine proper usage of the IP address, subnet mask, name server and default gateway in a routed network.

- Learn Internet structure and advancements related to standard problems.

TEXT / REFERENCE BOOKS

1) Computer Networks, Andrew S. Tanenbaum, 3rd Edition, Prentice Hall of India
2) Data and Computer Communications, William Stallings, 3rd Edition, Prentice Hall of India
3) Data Communications and Networking, Behrouz A. Forouzan, 3rd Edition, Tata McGraw Hill

(EC728) SATELLITE COMMUNICATION (ELECTIVE - IV)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES

- To present insightful understanding of the basics of orbital mechanics, the types of satellite orbits, the location of ground stations, the look angles from ground stations to the satellite, link budget calculations to provide sufficient margin for performance with the aid of the various types of modulation, error correcting codes, and encryption.
- Moreover, the students are also exposed to a variety of topics related to mobile satellite systems for voice and internet communication and take a practical look at the engineering impact of the various satellite components like power, size, and material used and attitude control on its performance.

DETAILED SYLLABUS

[1] INTRODUCTION TO SATELLITE COMMUNICATION

The origin of satellite communications, A brief history of satellite communications, The current state of satellite communications, An overview of satellite communications.

[2] ORBITAL ASPECTS OF SATELLITE COMMUNICATIONS

The orbital mechanics, Look angle determination, Numerical examples, Orbital perturbations, Orbit determination, Launches and launch vehicles, Orbital effects in communications system performance-Doppler shift, Range variation, Eclipse, Sun transit outage.

[3] SPACECRAFT

Introduction, Spacecraft Subsystem, Attitude and orbit control system, Telemetry, tracing and command system, Power Systems, Communications subsystem, Spacecraft Antennas, Equipment reliability and space qualification.

[4] SATELLITE LINK DESIGN

Basic transmission theory, System noise temperature and G/T ratio, Design of downlink, Domestic satellite systems using small earth stations, Uplink design, Design of satellite links for specified C/N.

[5] MODULATION AND MULTIPLEXING TECHNIQUES FOR SATELLITE LINKS

Analog telephone transmission, Analog television transmission, Energy dispersal, Digital transmission, Digital modulation and demodulation, Digital transmission of voice, Digital TV and bandwidth compression, TDM.

[6] MULTIPLE ACCESS

FDMA, TDMA, CDMA, Estimating channel requirement, Practical demand access systems, Random access, Multiple access with on-board processing.

[7] ENCODING AND FORWARD ERROR CORRECTING FOR DIGITAL SATELLITE LINKS

Error Detection and correction, Channel capacity, Error detection coding, Error detection and

correction capabilities of linear block codes, Binary Cyclic codes, Performance of block error correction codes, convolution codes, Implementation of error detection on satellite links.

[8] PROPAGATION ON SATELLITE EARTH PATHS AND ITS INFLUENCE ON THE LINK DESIGN

Quantifying attenuation and depolarization, Propagation effects that are not associated with hydrometeors, Rain and ice effects, Eliminating or alleviating propagation effects. Comparison of Satellite band in terms of signal attenuation and fading.

[9] EARTH STATION TECHNOLOGY

Earth station design, Basic antenna theory, Design of large antennas, Tracking, Small earth station antennas, Equipment for earth stations, Video receive only systems, Frequency coordination.

[10] SATELLITE TELEVISION

Transponder frequencies and designations, Satellite television receivers, Legal matters, direct broadcast satellites.

[11] VSAT

VSAT fundamentals, VSAT technology, VSAT networks, Applications.

[12] GPS

GPS Fundamentals, GPS technology, Applications.

LEARNING OUTCOMES

On completion of this course, students will be able to …

- Understand the basic concept in the field of Satellite Communication and realize how a satellite is placed in an orbit.
- Compute look angles: Elevation and azimuth, the coverage angle and angle of visibility and consequently determine the coverage area.
- Calculate the received carrier power at the input of earth station receiver or satellite transponder, the noise power as well as the carrier to noise ratio at the input of earth station or satellite transponder.
- Design a satellite system with reference to link power budget.
- Analyze the design requirements and the performance of satellite communication systems with respect to modulation techniques and error correction codes.
- Understand about the Satellite Access schemes and perform a comparative analysis.

TEXT / REFERENCE BOOKS

1) Satellite Communications, Timothy Pratt & Charles W. Bostian, 2nd Edition, John Willey & Sons.
2) Satellite Communications, Dennis Reddy, 3rd Edition, Tata McGraw Hill.

(EC729) FIBER OPTIC COMMUNICATION (ELECTIVE - IV)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES

- To understand basic components of fiber optic communication system.
- To analyze behavior of various types of optical sources, fiber optic cables and receiver system components.
- To apply these concepts in implementation and design of various communication systems employing fiber optic link.
- To understand effect of joints, repeaters, noise in such systems.

DETAILED SYLLABUS

[1] INTRODUCTION OPTICAL FIBER COMMUNICATIONS

Introduction, The Nature of Light, Basic Optical Laws and Definitions, Optical Fiber Modes and Configurations, Mode Theory for Circular Waveguides, Single-Mode Fibers, Graded-Index Fiber Structure, Basics of Fiber Materials

[2] SIGNAL DEGRADATION IN OPTICAL FIBERS

Attenuation, Signal Distortion in Optical Waveguide, Pulse Broadening in Graded-Index Waveguides, Mode Coupling, Design Optimization of Single-Mode Fibers

[3] OPTICAL SOURCES

Basics of Optical Sources, Light-Emitting Diodes (LEDs), Laser Diodes, Light Source Linearity, Modal, Partition, and Reflection Noise

[4] POWER LAUNCHING AND COUPLING

Source-to-Fiber Power Launching, Lensing Schemes for Coupling Improvement, Fiber-to-Fiber Joints, LED Coupling to Single-Mode Fibers, Basics of Fiber Splicing, Optical Fiber Connectors

[5] PHOTO DETECTORS

Physical Principles of Photodiodes, Photo detector Noise, Detector Response Time, Avalanche Multiplication Noise, Temperature Effect on Avalanche Gain, Comparison of Photo detectors

[6] TRANSMISSION SYSTEMS

Digital

Point-to-Point Links, System Considerations, Link Power Budget, Rise-Time Budget, First-Window Transmission Distance, Transmission Distance for Single-Mode Links,Noise Effects on System Performance

Analog

Overview of Analog Links, Carrier-to-Noise Ratio, Multichannel Transmission Techniques.

[7] WDM CONCEPTS AND COMPONENTS

Operational Principles of WDM, Passive Components, Tunable Sources, Tunable Filters

[8] OPTICAL AMPLIFIERS

Basic Applications and Types of Optical Amplifiers, Semiconductor Optical Amplifiers, Erbium-Doped Fiber Amplifiers, System Applications, Wavelength Converters

[9] OPTICAL NETWORKS

Basic Networks, SONET/SDH, Broadcast-and-Select WDM Networks, Wavelength-Routed Networks, Nonlinear Effects on Network Performance, Performance of WDM+EDFA Systems, Solitons, Optical CDMA

[10] MEASUREMENTS

Measurement Instruments, Attenuation Measurements, Dispersion Measurements, OTDR Field Applications

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand different types of basic components of fiber optic systems.
- Select appropriate transmitter and receiver in the fiber optic communication system.
- Identify the need of various components of the whole system.
- Apply channel design optimization and analysis.
- Evaluate various types of modulation schemes in fiber systems

TEXT / REFERENCE BOOKS

1) Optical fiber Communication, Gerd Kaiser, 3rd Edition, McGraw Hill
2) Fiber-Optic Communication Systems, Govind P. Agrawal, 1st Edition, Wiley Publication.

(EC724) WIRELESS COMMUNICATION (ELECTIVE - II)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	00	00	100	4	0	0	4

OBJECTIVE

- To offer fundamental understanding of various aspects of wireless communication including cellular structure, interference and fading issues with different minimization techniques. The subject makes students aware of various mobile telephony standards like GSM-2G, 2.5G, 3G (WCDMA) and 4G-Long Term Evolution (LTE).

DETAILED SYLLABUS

[1] INTRODUCTION TO WIRELESS COMMUNICATION SYSTEM
Evolution of mobile radio communications, Cellular Telephone System.

[2] MODERN WIRELESS COMMUNICATION SYSTEMS
Second generation (2G) cellular networks, Third generation (3G) wireless networks, Bluetooth and personal area network.

[3] THE CELLULAR CONCEPT-SYSTEM DESIGN FUNDAMENTALS
Introduction, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Trunking and grade of service, Improving coverage & capacity in cellular systems.

[4] MOBILE RADIO PROPAGATION
Large scale path loss, Small scale path loss fading and multi path Doppler shift, Fading offset, Level crossing rate, Fade duration.

[5] MODULATION TECHNIQUES FOR MOBILE RADIO
Digital modulation - an overview, Pulse shaping Techniques, Linear modulation techniques, Constant envelope modulation, combined linear and constant envelope modulation (QAM), Spread spectrum modulation techniques.

[6] EQUALIZATION, DIVERSITY, AND CHANNEL CODING
Introduction, Fundamentals of equalization, Training , A generic adaptive equalizer, Equalizers in a communications receiver, Survey of equalization techniques, Linear equalizers, Nonlinear equalization, Diversity techniques, RAKE receiver, Interleaving, Fundamentals of channel coding.

[7] SPEECH CODING
Introduction, Characteristics of speech signals, Quantization techniques, Adaptive differential pulse code modulation (ADPCM), Vocoders, Linear predictive coders, choosing speech codec for mobile communications, The GSM codec

[8] MULTIPLE- ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION
Introduction, Frequency division multiple access (FDMA), Time division multiple access,

Spread spectrum multiple access, Frequency hopped multiple access (FHMA), Code- division multiple access (CDMA), Hybrid spread spectrum techniques, Space division multiple access (SDMA), Packet radio, Capacity of cellular systems.

[9] GSM SYSTEM

RF specifications, Time slot data structure, Speech frame, Control channels System structure. HLR VLR AUC EIR MSC BSC BTS MS Equalization, Diversity, Channel Coding, Speech Coding.

[10] OVERVIEW OF 3G & 4G:

An overview of wireless systems, Techniques for high data rate in 3G, Brief about WCDMA, 3GPP Long Term Evolution (LTE)- Goals, System overview, Network structure, Main Features

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand principles of cellular systems, various issues like interference, capacity, frequency reuse etc.
- Analyze the trunking efficiency, grade of service, large scale and small scale multipath fading.
- Understand different digital modulation techniques and spread spectrum techniques used for wireless communication
- Analyze various techniques to overcome fading effects like channel coding, equalization, diversity and, interleaving.
- Understand the standards used for mobile telephony like GSM and CDMA IS-95 with the details about air interface, network architecture, various channels and call establishment.

TEXT / REFERENCE BOOKS

1) Wireless communication, Theodore Rappaport, 2nd Edition, Prentice Hall of India.
2) Wireless Communication, W. C. Y. Lee, 3rd Edition, Tata McGraw Hill.
3) Wireless Communications, Andreas F. Molisch, 2nd Edition, A John Wiley and Sons, Ltd.
4) Wireless Communications and Networking, Vijay Garg, M.K. Publishers

(EC726) RADAR & NAVIGATION (ELECTIVE – II)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	00	00	100	4	0	0	4

OBJECTIVE

- To inculcate the strong foundation of radar which help the students to understand navigation system.

DETAILED SYLLABUS

[1] ELEMENTARY CONCEPT
Fundamental concept of Radar, Function Performed by Radar, Overall System Consideration, Types of Radar Targets, Radars' Waveform, Power & Energy.

[2] RADAR EQUATION
Radar Equation, Important Network Definitions and Properties, Incremental Modeling of Noise Sources, Incremental Modeling of Noisy Networks, Practical Modeling of Noisy Sources and Networks, Overall Radar Receiver Model.

[3] RADAR CROSS SECTION
Cross Section for Small Targets, Target Scattering Matrices, Examples of Target Cross Sections, Cross Sections of Area Targets, Sea Surfaces as Area Targets, Land Surfaces as Area Targets, Cross Section of Volume Targets, Meteorological Volume Targets, Cross Section Fluctuations and Models.

[4] RADAR SIGNAL & NETWORKS
Real Radar Signals, Complex Radar Signal, Analytic Radar Signals, Duration, Frequency and Bandwidth of Signals, Transmissions of Signals through Networks, Matched Filter for Noise, Ambiguity Function.

[5] MATHEMATICAL FUNDAMENTALS OF NAVIGATION
Reference Frame, Principles of Positioning Determination, Principles of Velocity Determination, Principles of Attitude Determination, Accuracy Measures, Least Square Estimation, Principles of Routing and Guidance.

[6] MAPS
Types of Maps, Map Projections, Digital Map.

[7] TERRESTRIAL NAVIGATION
Instruments and Observables, Position Determination, Drift.

[8] TERRESTRIAL RADIO NAVIGATION
Point Source Systems, Area Based Systems, Aircraft Landing Systems.

[9] SATELLITE BASED NAVIGATION
GPS, GLONASS, Galileo, Other Satellite Based Navigation Systems.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand concept of radar and navigation system.
- Evaluate the problems regarding radar.
- Understand map and utilizing navigation system with map.

TEXT / REFERENCE BOOKS

1) Radar Principles, Peyton Z. Peebles, 2nd Edition, John Wiley & Sons.
2) Principles of Positioning and Guidance, Hoffmann-Wellenhof, Legat, Wieser, 1st Edition, Springer.
3) Global Positioning Systems, Inertial Navigation, and Integration, Mohinder S. Grewal, Lawrence R. Weill, Angus P. Andrews, 2nd Edition, John Wiley & Sons.

(EC723) TERM PROJECT (SOFTWARE)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
0	0	2	0	0	0	50	50	0	0	1	1

OBJECTIVE

- To offer a profound understanding and implementation of any system or concept using any programming language or software tool.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Design and Implement any system.
- Simulation of any technical concept.
- Develop a GUI to support the utilization of hardware.
- Learn & use new tools for simulation of technical ideas.
- Represent real world complex problems in term of software language and solving them.
- Visualize & Analyze theoretical concepts.

(EC717) CODING THEORY & COMPRESSION TECHNIQUES

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	0	60	40	00	00	100	4	0	0	4

OBJECTIVES

- To present insightful understanding of the basic concepts of probability theory followed by information theory, source coding, channel model, channel capacity, channel coding, and their applications, specifically with respect to a communication system.
- Moreover, the students are also exposed to a variety of topics of compression techniques, ranging from basic dictionary techniques to the advanced video compression techniques, and their applications.

DETAILED SYLLABUS

[1] PROBABILITY THEORY AND RANDOM PROCESS
Introduction to the theory of probability, Random variables, Statistical averages, The central-limit theorem, correlation, binary case.

[2] AN INTRODUCTION TO INFORMATION THEORY
Measure of information, Source encoding, Error-free communication over a noisy channel, The channel capacity of a discrete memory less channel, channel capacity of a continuous channel, Practical communication systems in the light of Shannon's equation.

[3] ERROR-CORRECTING CODES
Introduction, Linear block codes, Cyclic codes, Burst-error- detecting and correcting codes, Interlaced codes for burst and random error correction, Convolution codes, comparison of coded and uncoded systems.

[4] DICTIONARY TECHNIQUES
Introduction, static Dictionary, diagram coding, Adaptive Dictionary, The LZ77 approach, The LZ78 approach, File compression, Image compression (GIF), Compression over modems

[5] TRANSFORM CODING
Introduction, The transform, Transforms of interest, Discrete cosine transform, Discrete sine transform Quantization and coding of transform coefficients, Application to image compression-JPEG: The transform, quantization, coding.

[6] VIDEO COMPRESSION STANDARDS
Introduction, MPEG, H.261, H-263, H-264, Packet Video

LEARNING OUTCOMES

On completion of this course, students will be able to …

- Understand the idea of deployment of set theoretic organizational tools to solve complex practical problems
- Build-up the notion of probability theory with respect to communication system
- Demonstrate the basic theory of codes
- Describe the real life applications based on the fundamental theory
- Analyze the communication systems with respect to the information theory
- Understand, implement and analyze source codes and channel codes
- Design the encoder and decoder of block code and convolutional code
- Solve mathematical problems involving error-correcting codes by linking them to concepts from elementary number theory, linear algebra and elementary calculus.
- Understand image and video compression techniques and perform a comparative analysis

TEXT / REFERENCE BOOKS

1) Modern Digital And Analog Communication Systems, B. P. Lathi, 3rd Edition, Hold Saunders International
2) Introduction to Data Compression, Khalid Sayood, 2nd Edition , Elsevier
3) Data Compression, David Salomon, 3rd Edition , Springer
4) Information Theory, Coding & Cryptograph, Ranjan Bose, 2nd Edition , Tata McGraw Hill

(EC722) EMBEDDED SYSTEMS (ELECTIVE - III)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVE

- To offer in-depth understanding of the ARM Cortex-M processors and software interface standard, the interface protocols like SPI and I2C, and the fundamentals of operating system.

DETAILED SYLLABUS

[1] INTRODUCTION TO ARM CORTEX-M PROCESSORS
ARM Cortex-M processors, Advantages of the Cortex-M processors, Applications of the ARM Cortex-M processors, ARM ecosystem

[2] CORTEX-M ARCHITECTURE
Introduction to the architecture, Programmer's model, Behaviour of the application program status register

[3] MEMORY SYSTEM
Overview, Memory endianness, Bit-band operations, Memory access attributes

[4] EXCEPTIONS AND INTERRUPTS
Overview, Exception types, Interrupt management

[5] OS SUPPORT FEATURES
Overview of OS support features, Shadowed stack pointer, SVC exception, PendSV exception

[6] I2C PROTOCOL
Overview, I2C features, I2C bus hardware configuration, I2C Protocol, Driving I2C bus

[7] SPI PROTOCOL
Overview, SPI operation, Clock polarity and phase in SPI devices, SPI bus configurations

[8] SOFTWARE INTERFACE STANDARD
Overview, Areas of standardization in CMSIS-Core, Organization of CMSIS-Core, using CMSIS-Core Benefits of CMSIS-Core, Various versions of CMSIS

[9] INTRODUCTION TO OPERATING SYSTEMS
Operating System Concepts, System Calls

[10] PROCESSES
The Process Model, Threads, Interprocess Communication, Classical IPC Problems, Process Scheduling.

[11] INPUT/OUTPUT

Principles of I/O Hardware & Software, Device Drivers, Device-Independent I/O Software, User-Space I/O Software, Deadlocks, RAM Disks, Disk Hardware and Software, Clock Hardware and Software, Terminal Hardware and Software.

LEARNING OUTCOMES

At the completion of the course, students will be able to …

- Understand ARM Cortex – M3 and M4 architectures and program development tools
- Develop assembly / high-level language programs of ARM Cortex – M3 and M4 processors
- Interface devices using SPI and I2C protocols
- Develop applications using FREERTOS operating system

TEXT / REFERENCE BOOKS

1) The Definitive Guide to ARM Cortex -M3 and Cortex-M4 Processors, Joseph Yiu, : 3rd Edition, Newness Press
2) Operating Systems: Design and Implementation, A. S. Tanenbaum, A. S. Woodhull, 3rd Edition, Prentice Hall of India
3) Operating Systems, William Stallings, Edition 6th, Pearson Education
4) The Designers guide to the Cortex-M processor family, Trevor Martin Edition 2nd, Newnes Press

(EC727) RF CIRCUIT DESIGN (ELECTIVE - III)

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Prac	Total	Lect	Tut	Prac	Total
4	0	2	60	40	25	25	150	4	0	1	5

OBJECTIVES

- To expose the students to the concepts of Radio Frequency Networks and their applications followed by scattering parameters and variety of techniques of impedance matching at RF.
- Moreover, the subject also discusses the RF transceiver architectures and other active and passive subsystems of the RF network and their applications.

DETAILED SYLLABUS

[1] INTRODUCTION
Importance of RF circuit design, RF behavior of passive component like resistors, inductors, capacitors

[2] SCATTERING PARAMETERS
Definitions, chain scattering parameters, conversion between Z and S parameters, generalization of S-parameters, measurement of S-parameters

[3] IMPEDANCE MATCHING
Q factor, resonance, bandwidth, Smith Chart, matching networks using lumped elements, Quarter wave transformer, Stub matching RF

[4] TRANSCEIVER ARCHITECTURES
Receiver Front End-General Design Philosophy, Harmonic distortion, Intermodulation, Third-order Intercept Point (IP3), Cascaded non-linear stages, Noise figure (NF), cascaded noisy stages, Calculation of NF, IIP3 of receiver front end, transmitter architecture

[5] RF FILTER DESIGN
Ideal and Approximate Filter Types, Transfer Function and Basic Filter Concepts, Filter Design by Image Parameter Method, Filter Design by the Insertion Loss Method, Filter Design Issues

[6] AMPLIFIER DESIGN
Stability Considerations, Amplifier Design for Maximum Gain, Constant Gain Circles, Constant Noise Figure Circles, Low Noise Amplifier design, Broad band Amplifiers, Different classes of amplifiers

[7] OSCILLATOR DESIGN
Feedback and basic concept, Crystal Oscillators, RF Transistor Oscillators, Phased-Locked Loop, Frequency Synthesizers

[8] MIXER DESIGN
Mixer Characteristics, Switching type Mixers, Diode Mixers, FET Mixers, Other Mixers

[9] OTHER RF CIRCUITS

Power combiners/dividers, directional couplers, hybrid couplers, isolators, Resonant circuits, Recent trends in RF circuits

LEARNING OUTCOMES

After successful completion of the course, student will be able to…

- Understand the issues and challenges of RF circuit design.
- Understand the behavior of active and passive electronic components at RF & Microwave frequencies.
- Apply the theory of electromagnetic wave propagation through different transmission lines and concept of impedance matching.
- Analyze microwave circuits and devices using scattering parameters.
- Design basic RF circuits.
- Evaluate RF transceiver architectures.
- Determine system level design specifications to meet the required RF system performance.

TEXT / REFERENCE BOOKS

1) Radio-Frequency and Microwave Communication Circuits, Devendra K. Misra, 2nd Edition, John Wiley & Sons
2) Microwave Engineering, David M. Pozar, 4th Edition, John Wiley & Sons
3) RF Circuit Design, Theory & Applications, Reinhold Ludwig and Pavel Bretchko, 2nd Edition, Pearson Education

(AF801) PROJECT/INDUSTRIAL TRAINNING

(AF802) SEMINAR

Teaching Scheme (Hours)			Marks					Credit Structure			
Lect	Tut	Prac	Ext	Sess	TW	Semi	Total	Lect	Tut	Prac	Total
0	0	28	300	0	100	0	400	0	0	14	14
0	4	0	0	0	50	50	100	0	4	0	4
							500				18

OBJECTIVES

- Assist the student's development of employer-valued skills such as teamwork communication and attention to detail.
- Students should design/develop & fabricate the hardware and/or software system.
- They may also undertake project involving study and analysis of existing electronics systems in the industry and suggesting modifications for revamping the system.

LEARNING OUTCOMES

By undergoing project in industry, students should able to …

- Enhance teamwork and communication skills in professional fields.
- Aware the development in technologies in recants trends in respective fields.
- Correlate theoretical knowledge in practical to integrate any system.
- To provide an opportunity to implement their ideas for the designing of various system.
- Enhance presentation skills of work done.