Study and Evaluating Scheme
Multi Point Entry and Orgainised System (<W>)
Electronics Engineering (Medical Electronics)

Effective <W><W>

Sr. No.	Subject	L	T	P	C R E D I T S	Evaluation Scheme: Internal Assessment Theory Max. marks	Internal Assessment Practicals Max. marks	External Assessment Written Paper Max. marks	Hrs.	External Assessment Practicals Max. marks	Hrs	Total Marks
1. CM101	Communication Techniques	3	-	-	3	50	-	100	3	-	-	150
2. BS 110	Applied Math-I	3	2	-	4	50	-	100	3	-	-	150
3. BS 111	Applied Physics	3	-	2	4	50	25	100	3	50	3	225
4. ES 122	Basic Electricity	3	-	2	4	50	25	100	3	50	3	225
5. ES 123	Electronics Devices and Circuit s-I	3	1	3	5	50	25	100	3	50	-	225
6. ES 126	W/shop Practice-I	-	-	6	3	-	50	-	3	100	3	150
Term –I Total :credits 23----------Marks <W>												
7. BS 210	App. Math-II	3	2	-	4	50	-	100	3	-		30
8. ES 222	Elect. Engg	3	-	2	4	50	25	100	3			<W>
9. ES 223	Introduction to computers	1	-	6	-	-	50	-	-	100	3	100
10. EX 220	Electronic components & materials	4	-	-	4	50	-	100	3	-	-	<W>
11. ES 224	Engg. Drawing	-	-	6	3	-	50	100	-	-	-	<W>
12. EX 221	W/S Prac-II	-	-	8	4	-	50	-	-	100	3	<W>
Term II Total credits ----------23----- ----------Marks----------												

Sr. No.	Subject	L	T	P	CREDITS	Evaluation Scheme Marks						Total
						Internal Assessment		External Assessment				
						Theory	Practicals	Written Paper		Practicals		
						Max. Marks	Max. marks	Max. Marks	Hrs.	Max. marks	Hrs	
13. EX 330	Principle of Comm Engg.	3	-	2	4	50	25	100	3	50	3	225
14. EX 331	Digital Electronics	3	1	3	5	50	25	100	3	50	3	225
15. EX 332	Network, filters & Transmission Lines	3	-	4	5	50	25	100	3	50	3	225
16. EX 333	Electronic Devices &Circuits-II	3	1	3	5	50	25	100	3	50	3	225
17. EX 334	Electronic Fabrication Techniques	1	-	6	4	-	50	-	-	100	3	150
	Term. III credits----------				23	----------			Marks			----------100
18. EX 431	Electronics Devices & Circuits-III	3	-	4	5	50	25	100	3	50	3	225
19. EX 432	Introduction to Micro-pocessors	3	-	2	4	50	25	100	3	50	3	225
20. EX 433	Electronic Instruments & measurements	3	-	2	4	50	25	100	3	50	3	225
21. EX 435	Electronic Drawing & Design	-	-	4	2	-	50	100	3	50	3	200
22. EX 436	Minor Project	-	-	6	3	-	50	-	-	100	-	150
23. CM 403	Industrial Management & Entre-preneurship Development	4	-	-	4	50	-	100	3	-	-	150

Term IV credits---------- 22 ----------Marks <W>

Sr. No.	Subject	L	T	P	CREDITS	Evaluation Scheme						Total Marks
						Internal Assessment		External Assessment				
						Theory	Practicals	Written Paper		Practicals		
						Max. Marks	Max. marks	Max. marks	Hrs.	Max. marks	Hrs	
24. EX 530	PC Organi-Sation	3	-	2	4	50	25	100	3	50	3	225
25. EX 633	Digital System Design	3	-	2	4	50	25	100	3	50	3	225
26. EX 536	Trouble Shooting & Mainten-nance of ELX equipment	3	-	2	4	50	25	100	3	50	3	225
27. EX 537	Product Design and Development	-	-	6	3	-	50	-	-	100	3	150
28. EX 540	Imaging Techniques & Equipment	3	-	2	4	50	25	100	3	50	3	225
29. EX 541	Basic Medical Electronics	3	-	2	4	50	25	100	3	50	3	225
	Term V credits----------23----------Marks											1275
30. EX 641	Medical Electronics I	3	-	2	4	50	25	100	3	50	3	225
31. EX 642	Medical Electronics II	3	-	2	4	50	25	100	3	50	3	225
32. EX 636	Major Project	-	-	9	5	-	100	-	-	100	3	200
33. EX	Elective-1	3	-	2	4	50	25	100	3	50	3	225
34. EX	Elective-2	3	-	2	4	50	25	100	3	50	3	225
	Term VI credits---------- 21 ---------- -Marks 1100											

List of Electives I

EX 531 Communication Systems
EX 532 Consumers Electrtonics
IC 533 Process Control and Instrumentation
EX 535 Computer Programming & Applications
EX 637 Advanced Microprocessor
EX 634 Microprocessor System Design

NOTE :
(i) Courses mentioned at Sr.No.1 to 23 are common with other branches of Electronics.
(ii) Diploma will be awarded after completion <W> 135 credits
(iii) Communication Techniques may be offered an audit course for 10+2 stream students.
(iv) A three day Awareness Camp shall be offered on Ecology and Environment during the fourth term.
(v) A three day Awareness Camp shall be offered on Entrepreneurship Development during the fifth term.

ELECTRONICS ENGINEEERING (BIOMEDICAL ELECTRONICS)
SUGGESTED PATHWAYS

TERM 1		10+Stream				10+2 Stream	
BM	101	Communication Techniques	3	EX	331	Digital Electronics	5
BS	110	Applied Mathematics-I	4	ES	223	Introduction to Computers	4
BS	111	Applied Physics	4	EX	330	Principle of Comm. Engineering	4
BS	122	Basic Electricity	4	ES	122	Basic Electricity	4
ES	123	Electronic Devices &	5	ES	123	Electronic Device & Circuits-I Circuits-I	5
ES	126	W/shop Practice-I	3	ES	126	W/shop Practice-I	3
		Student centred Activities	-			Student centred activities	-
			23				

Term 2		10+ Stream				10+2 Stream	
BS	210	Applied Math-II	4	EX	433	Electronic Instru-Ments & measurements	4
ES	222	Electrical Engineering	4	ES	222	Electrical Engineering	4
ES	223	Introduction to Computers	4	EX	432	Introduction to Microprocessors	4
EX	220	Electronics components & materials	4	EX	220	Electronics components & materials	4
ES	224	Engg. Drawing	3	ES	224	Engineering Drawing	3
EX	221	W/shop Practice-II	4	EX	221	W/shop Practice –II	4
		Student centred Activities	-			Student centred activities	--
			23				

Term 3		10+Stream				10+2 Stream	
ES	330	Principal of Comm. Engg.	4	EX	540	Imaging Technique & Equipment	
EX	331	Digital Electronics	5	EX	633	Digital System Design	
EX	332	Network, Filters & Transmission Lines	5	EX	332	Network, Filters & Transmission Lines	
EX	333	Electronic Devices & Circuits – II	5	EX	333	Electronic Devices Circuits - II	

334	Electronics Fabrication Techniques	4	EX	334	Electronics Farbi-Cation Techniques	
	Student centred Activities	-			Student centred activities	
		23				
Term 4	10+ Stream				10 + 2 Stream	
431	Eectronic Devices & Circuits – III	5	EX		Electronic Devices & Circuits – III	5
432	Introduction to Micro-Processors	4	EX	642	Medical Electronic II	4
433	Electronic Instruments & Measurements	4	EX	436	Minor Project	3
435	Electronic Drawing and	2	EX	435	Electronic Drawing Design and Design	<W>
436	Minor Project	3	EX	636	Major Project	
403	Indl. Management & ED	4	CM	403	Indl. Management & ED	
	Student centred Activities	-			Student centred - activities	
		22<W>				23
Term 5	10+ Odd Term				10+2 Odd Term	
530	PC Organisation	4	EX	530	PC Organisation	
633	Digital System	4	EX	532	Medical Design Electronics-I	
536	Trouble Shooting and Maintenance of Electronic Equipment	4	EX	536	Trouble shooting and - Maintenanceof Electronic Equipment	
537	Product Design & Dev.	3	EX	537	Product Design & Dev.	<W>
540	Imaging Technique & Equipment	4	EX	540	Elective – II	4
541	Basic Medical Electronics	4	EX	541	Basic Medical Electronics	4
	Student centred Activities	-			Student centred activities	
		23				

Term 6 10+ Even Term			10+2 Even Term
EX	641	Medical Electronics-I	4
EX	642	Medical Electronics-II	4
EX		Elective-I	4
		Elective-II	4
EX	636	Major Project	5
		Student centred activities	–
			21

List of Electives :

EX 531 Communication System
EX 532 Consumers Electronics
EX 535 Computer Programming & Applications
EX 337 Advanced Microprocessor
EX 634 Microprocessor System Design

Note : (i) Courses mentioned at Sr.No.1 to 23 are common with other branches of Electronics.

(ii) Diploma will be awarded after completion of 135 credits.

(iii) Communication Techniques may be offered as an audit course for 10+2 stream students.

(iv) A three day Awareness Camp shall be offered on Ecology and Environment during the fourth term.

(v) A three day Awareness Camp shall be offered on Entrepreneurship Development during the fifth term.

BOARD OF TECHNICAL EDUCATION, DELHI
Study and Evaluation Scheme- Semester System
ELECTRONICS & COMMUNICATION ENGINEERING

Semester I — Revised : From July, 1996 Session

Sr. No.	subject	L	T	P	CREDIT	Evaluation Scheme: Internal Assesment – Theory Max. marks	Internal Assesment – Practicals Max. marks	External Assessment – Written Paper Max. Hrs	External Assessment – Written Paper marks	External Assessment – Practicals Max. Hrs	External Assessment – Practicals marks	Total Marks
1.	CM101 Communication Techniques	3	-	-	3	50	-	3	100	-	4	130
2.	BS 110 Applied Math-I	3	2	-	4	50	-	3	100	-	4	150
3.	BS 111 Applied Physics	3	-	2	4	50	25	3	100	3	50	225
4.	ES. 122 Basic Electricity	3	-	2	4	50	25	3	100	3	50	225
5.	ES 123 Eletronic Devices & Circuits –I	3	1	3	5	50	25	3	100	3	50	225
6.	ES 126 W/shop Practice-I	-	-	6	3	-	50	-	3	100	3	150
	Student Centred Activities	4										
		15	3	17	23	250	125	500		250		1125

Semester II

7.	BS 210 App.Math-II	3	2	-	4	50	-	3	100	-	-	150
8.	ES 222 Elect.Engg	3	-	2	4	50	25	3	100	3	50	225
9.	ES 223 Introduction to computers	1	-	6	4	-	50	-	-	100	3	150
10.	EX. 220 Electronic components & materials	4	-	-	4	50	-	3	100	-	-	150
11.	ES 224 Engg. Drawing	-	-	6	3	-	50	100	-	-	-	150
12.	EX 221 W/S Prac-II	-	-	8	4	-	50	-	-	100		150
	Student Centred Activities	4										
		11	2	26	23	150	175	400		250		97

BOARD OF TECHNICAL EDUCATION, DELHI
Study and Evaluation Scheme- Semester System
ELECTRONICS & COMMUNICATION ENGINEERING

Semester III Revised : From July, 1996 Session

Sr. <W>	Subject	L	T	P	CREDITS	Evaluation Scheme						Total Marks
						Internal Assesment			External Assessment			
						Theory	Practicals	Written Paper	Practicals			
						Max. marks	Max. marks	Max. Hrs marks	Max. Hrs marks			
3. EX 330	Principle of Comm. Eng.	3	-	2	4	50	25	100	3	50	3	225
4. EX 331	Digital Electronics	3	1	3	5	50	25	100	3	50	3	225
5. EX 332	Nework filters & Transmission Lines	3	-	4	5	50	25	100	3	50	3	225
6. EX 333	Electronic Devices & Circuits-II	3	1	3	5	50	25	100	3	50	3	225
7. EX 334	Electronic Fabrication Techniques	1	-	6	4	-	50	-	-	100	3	150
	Student Centred Activities	4										
		13	2	22	23	200	150	400		300		1050
Semester IV												
8. EX 431	Eectronics Devices & Circuits-III	3	-	4	5	50	25	100	3	50	3	225
9. EX 432	Introduction To Microrocessors	3	-	2	4	50	25	100	3	50	3	225
10. EX 433	Electronic Instruments & measurements	3	-	2	4	50	25	100	3	50	3	225
11. EX 435	Electronic Drawing & Design	-	-	4	2	-	50	100	3	-	-	150
12. EX 436	Minor Project	-	-	6	3	-	50	-	-	100	-	150
13. CM 403	Industrial Student Centred Activities	4	-	-	4	50	50	100	3	-	-	150

13	-	22	22	200	175	500		250	1125

BOARD OF TECHNICAL EDUCATION, DELHI
Study and Evaluation Scheme- Semester System
ELECTRONICS & COMMUNICATION ENGINEERING

Semester V Revised : From July, 1996 Session

Sr. No.	Subject		L	T	P	CREDITS	Evaluation Scheme						Total Marks
							Internal Assesment		External Assessment				
							Theory	Practicals	Written Paper		Practicals		
							Max. marks	Max. marks	Max. Hrs	marks	Max. Hrs	marks	
24.EX	530	PC organisation	3	-	2	4	50	25	3	100	3	50	225
25.EX	531	Communication System	3	-	2	4	50	25	3	100	3	50	225
26.EX	532	Consumer Electronics	3	-	2	4	50	25	3	100	3	50	225
27.EX	536	Trouble Shooting & maintenance of Electronics equipment.	2	-	4	4	25	50	3	100	3	50	225
28.EX	537	Product	-	-	6	3	-	50	-	-	3	100	150
29.EX	538	Industrial Electronics & Instrumentation	3	-	2	4	50	25	3	100	3	50	225
	Student Centred Activities		4										
			16	-	22	23	225	200		500		350	<W>

Semester VI

30.EX	630	TV Engg	3	-	2	4	50	25	3	100	3	50	225
31.EX	631	Advanced Communication System	3	-	2	4	50	25	3	100	3	50	225
32.EX	Elective-I		3	-	2	4	50	25	3	100	3	50	225
33.EX	Elective-2		3	-	2	4	50	25	3	100	3	50	225
34.EX	636	Major Project (industry).	-	-	9	5	-	100	-	-	100	-	200
	Student Centred Activities		4										

12	-	21	21	200	200	400		300	1125

List of. Electives :

EX 632	Microwave Engineering
EX 633	digital system
EX 634	Microprocessor system Design
EX 535	Computer programming Application
EX 637	Advanced Microprocessor
CT	Bio Medical instrumentation

NOTE :
(i) Courses mentioned at Sr. No. 1 to 23 are common with other banches of E1ectronics
(ii) A three day Awareness Camp shall be offered on, Eco1ogy and Environment during the fourth semester
(iii) A three day Awareness Camp shall be offered on Entreprneuship Deve1opment during the fifth semester.

BOARD QF TECHNICAL EDUCATION, DELHI
Study and Evaluation Scheme - Semester System
ELECTRONICS ENGINEERING (DIGITAL ELECTRONICS & MICROPROCESSOR SYSTEM DESIGN)
Semester <W> Revised : From July, 1996 Session

Sr No.	Subject		L	T	P	CREDITS	Evaluation Scheme						Total Marks
							Internal Assessment		External Assessment				
							Theory Max. marks	Practicals Mak. marks	Written Paper Max Hrs	marks	Practicals Max Hrs	marks	
1.	CM101	Communication	3	-	-	3	50	–	100	3	-	-	150
2.	DS 110	Applied Math-I	3	2	–	4	50	–	100	3	-	-	150
3.	BS 111	Applied Physics	3	–	2	4	50	23	100	3	50	3	225
4.	ES 122	Basic Electricity	3	–	2	4	50	25	100	3	50	3	225
5.	ES 123	Electronic Devices & Circuits-I	3	1	3	5	50	25	100	3	50	3	225
6	ES 126	W/shop Practice-I	-	-	6	3	-	50	-	3	100	3	150
	Student Centred Activities		4										
			15	2	18	20	250	125	500		250		*1125*
Semester II													
7.	BS 210	App.Math..II	3	2	-	4	50	-	100	3	-	-	150
8.	ES 222	Elect.Engg	3	-	2	4	50	25	100	3	50	3	225
9.	ES 223	Introduction to computers	1	-	6	4	-	50	-	-	100	3	150
10.	EX 220	Electron components &material	4	-	-	4	50	-	100	3	-	-	150
11.	ES 224	Engg Drawing	-	-	6	3	-	50	100	-	-	-	150
12.	EX 225	W/S Prac-II	-	-	8	4	-	50	100	-	100	3	100
	Student Centred Activities		4										

	11	2	26	23	200	150	500		200	975

BOARD QF TECHNICAL EDUCATION, DELHI
Stud*y a*nd Evaluation Scheme - Semester *Sy*stem
ELECTRONICS ENGINEERING (DIGITAL ELECTRONICS *&*
MICROPROCESSOR SYSTEM DESIGN)

Semester III Revised : From July, 1996 Session

Sr. No.	Subject		L	T	P	CREDITS	Evaluation Scheme					Total Marks
							Internal Assessment		External Assessment			
							Theory Max. marks	Practicals Max. marks	Written Paper Max Hrs	marks	Practicals Max Hrs marks	
13.	EX 330	Principle of Comm. Engg.	3	-	2	4	50	25	100	3	50 3	<W>
14.	EX 331	digital Electronics	3	1	3	5	50	25	100	3	50 3	<W>
15.	EX 332	Network, Filters & Transmission Lines	3	-	4	5	50	25	100	3	50 3	<W>
16.	EX 333	Electronic Devices & circuits-11	3	1	3	5	50	25	100	3	50 3	<W>
17.	EX 334	Electronic Fabrication Technique	1	-	6	4	-	50	-	-	100 3	<W>
	Student centred Activities 4											
			14	-	21	23	200	150	400		300	<W>
Semester IV												
18.	EX 431	Electronic Devices & circuits-III	3	-	4	5	50	25	100	3	50 3	<W>
19.	EX 432	Introduction to Microprocessors	3	-	2	4	50	25	100	3	50 3	<W>
20.	EX 433	Electronic Instruments & measurements	3	-	2	4	50	25	100	3	50 3	<W>
21.	EX 435	Electronic Drawing & Design	-	-	4	2	-	50	100	3	- -	<W>
22.	EX 436	Minor Project	-	-	6	3	-	50	-	-	100 -	<W>
23	CM 403	Industrial Management & EDP	4	-	-	4	50	-	100	3	- -	<w>
	Student Centred Activities 4											

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13 - 24 22 200 175 500 200 <w>

BOARD OF TECHNICAL EDUCATION, DELHI
Study and Evaluation Scheme – Semester System
ELECTRONICS ENGINEERING (DIGITAL ELECTRONICS & MICROPROCESSOR SYSTEM DESIGN)
Semester Revised : From July, 1996 Session

Sr. No.	Subject		L	T	P	C R E D I T S	Evaluation Scheme						Total Marks
							Internal Assessment		External Assessment				
							Theory	Practicals	Written Paper		Practicals		
							Max. marks	Max. marks	Max. Hrs.	marks	Max. Hrs	marks	
<W>	EX	530	PC Orgnisation	3	-	2	4	50	25	100	3	50	3	225
<W>	EX	531	communication system	3	-	2	4	50	25	100	3	50	3	225
<W>	EX	537	Product Design & development	-	-	6	3	-	50	-	-	100	3	150
<W>	EX	539	Digital System Design	3	-	3	4	50	25	100	3	50	3	225
<W>	EX	536	Trouble Shooting & Maintenance of Electronic Equipment	2	-	3	4	50	25	100	3	50	3	225
<W>	EX	535	Computer Programme & applications	3	-	2	4	50	25	100	3	50	3	225
	Student centred Activities			4										
				14	–	22	23	250	175	500		350		1275
Semester VI														
<W>	EX	634	Microprocessor system Design	3	-	2	4	50	25	100	3	50	3	225
<W>	EX	637	Advanced Microprocessor & interfacing	3	-	2	4	50	25	100	3	50	3	225
<W>		636	Major Projects (industry based)	-	-	9	5	-	100	-	-	100	3	<W>
<W>	EX		Elective-I	3	-	2	4	50	25	100	3	<W>	3	<W>
<W>	EX		Elective-2	3	-	2	4	50	25	100	3	<W>	3	<W>
	Student centred Activities			4										
				12	-	21	21	250	125	500		250		1100

List of electives

EX 532 Consumer Electronics
EX 538 Industrial Electronics Instrumentation
EX 631 Advanced Communication System^'
IC 541 Principle of Automatic Control
IC 533 Process control & Instrumentation
IC 533 Transducers

NOTE :

(i) Courses mentioned at Sr.No.1 to 23 are common with other branches of Electronics

(ii) A three day Awareness Camp shall be offered on Ecology and Environment during the fourth semester.

(iii) A three day Awareness Camp shall be offered on Entrepreneurship Development during the fifth semester

BOARD OF TECHNICAL EDUCATION, DELHI
Study and Evaluation Scheme – Semester System
Electronics Engineering (Medical Electronics)

Semester I — Revised : From July, 1996 Session

	Subject	L	T	P	CR EDITS	Evaluation Scheme: Internal Assessment – Theory Max. marks	Internal Assessment – Practicals Max. marks	External Assessment – Written Paper Max.Hrs.	External Assessment – Written Paper marks	External Assessment – Practicals Max.Hrs	External Assessment – Practicals marks	Total Marks
1. CM 101	Communication Techniques	3	-	-	3	50	-	100	3	-	-	150
2. BS 110	Applied Math-I	3	2	-	4	50	-	100	3	-	-	150
3. BS 111	Applied Physics	3	-	2	4	50	25	100	3	50	3	225
4. ES 122	Basic Electricity	3	-	2	4	50	25	100	3	50	3	225
5. ES 123	Electronic Devices & Circuits-I	3	1	3	5	50	25	100	3	50	3	225
6. EX 121	W/shop Practice-I	-	-	6	3	-	50	-	3	100	3	150
	Student Centred Activities				4							
		15	2	18	20	250	125	500		250		1125

Semester II

7. BS 210	App.Math..II	3	2	-	4	50	-	100	3	-	-	150
8. ES 22	Elect.Engg.	3	-	2	4	50	25	100	3	50	3	225
9. ES 223	Introduction to computers	1	-	6	4	-	50	-	-	100	3	150
10. EX 220	Electronic components & material	4	-	-	4	50	-	100	3	-	-	150
11. ES 224	Engg. Drawing	-	-	6	3	-	50	100	-	-	-	150
12. EX 225	W/S Prac.-II	-	-	8	4	-	50	-	-	100	3	150
	Student Centred Activities				4							
		11	2	26	23	200	150	500		200		975

Semestor111 Revised : From July,<W>

Sr. No.	Subject	L	T	P	CR EDITS	Evaluation Scheme: Internal Assessment Theory Max. marks	Internal Assessment Practicals Max. marks	External Assessment Written Paper Max Hrs	External Assessment Written Paper Max marks	External Assessment Practicals Max Hrs	External Assessment Practicals Max marks	Total Marks
13. EX 330	Principle of Comm. Engg.	3	-	2	4	50	25	100	3	50	3	<W>
14. EX 331	Digital Electronics	3	1	3	5	50	25	100	3	50	3	<W>
15. EX 332	Network, Filters & Transmission Lines	3	-	4	5	50	25	100	3	50	3	<W>
16. EX 333	Electronic Devices & circuits-11	3	1	3	5	50	25	100	3	50	3	<W>
17. EX 334	Electronic Fabrication Technique	1	-	6	4	-	50	-	-	100	3	<W>
	Student centred Activities 4											
		14	-	21	23	200	150	400		300		1050
Semester IV												
18. EX 431	Electronic Devices & circuits-III	3	-	4	5	50	25	100	3	50	3	225
19. EX 432	Introduction to Microprocessors	3	-	2	4	50	25	100	3	50	3	225
20. EX 433	Electronic Instruments &measurements	3	-	2	4	50	25	100	3	50	3	225
21. EX 435	Electronic Drawing & Design	-	-	4	2	-	50	100	3	-	-	150
22. EX 436	Minor Project	-	-	6	3	-	50	-	-	100	-	150
23 CM 403	Industrial Management & EDP	4	-	-	4	50	-	100	3	-	-	150
	Student Centred Activities 4											
		13	-	24	22	200	175	500		250		1125

BOARD OF TECHNICAL EDUCATION, DELHI
Study and Evaluation Scheme – Semester System
Electronics Engineering (Medical Electronics)

Semester I — Revised : From July, 1996 Session

Subject		L	T	P	CR EDITS	Evaluation Scheme: Internal Assessment – Theory Max. marks	Internal Assessment – Practicals Max. marks	External Assessment – Written Paper Max.Hrs.	External Assessment – Written Paper marks	External Assessment – Practicals Max.Hrs	External Assessment – Practicals marks	Total Marks
24. EX 530	PC Organisation	3	-	2	4	50	25	100	3	50	3	225
25. EX 633	Digital System Design	3	-	2	4	50	25	100	3	50	3	225
26. EX 536	Trouble Shooting & equipment Nance of ELX equipment	3	-	2	4	50	25	100	3	50	3	225
27. EX 537	Product Design & Development	-	-	6	5	-	50	-	-	100	3	150
28. EX 540	Imaging Techniques & Equipment	3	-	2	4	50	25	100	3	50	3	255
	Student centred Activities	4										
29. EX 541	Medical Electronic I	3	-	2	4	50	25	100	3	50	3	225
	Student Centred Activities	4			-							
		15	-	20	23	250	175	500		350		1275

Semester VI

30. EX 641	Medical Electronics I	3	-	2	4	50	25	100	3	50	3	225
31. EX 642	Medical Electronics I	3	-	2	4	50	25	100	3	50	3	225
32. EX 636	Major Project	-	-	9	5	-	100	-	-	100	3	<W>
33. EX	Elective-1	3	-	2	4	50	25	100	3	50	3	225
34. EX	Elective-2	3	-	2	4	50	25	100	3	50	3	225
	Student Centred Activities	4										
		12	-	20	21	200	200	400		300		1100

List of electives :

EX 531 Communication System
EX 532 Consumer Electronics
EX 533 Process Control and Instrumentation
IC 634 Microprocessor System Design
EX 535 Computer Programming & Applications
EX 337 Advanced Microprocessor

NOTE :

(i) Courses mentioned at Sr.No.1 to 23 are common with other branches of Electronics

(ii) Communication Techniques may be Offered as an audit course for 10 + 2 stream students.

(iii) A three day Awareness Camp shall be offered on Ecology and Environment during the fourth semester.

(iv) A three day Awareness Camp shall be offered on Entrepreneurship Development during the fifth semester

DETAILED CONTENTS

ELECTRONIC AND COMMUNICATION ENGNEERING

1. CM 101 COMMUNICATION TECHNIQUES

RATIONALE

Diploma headers are supposed to communicate verbally and in written forms. Further technical report writing forms essentia1 requirement of these people. Keeping in view <W> requirements, this subject has been added to develop necessary competencies in written and oral communication. Efforts <W> be made to give practice of communication to the students.

DETAILED CONTENTS

1. One way and two way communication <W>
2. Essentials of good communication <W>
3. Methods of Communication, Oral, written and non-verbal <W>
4. Barriers to communication <W>
5. Techniques, of overcoming barriers <W>
6. Concept of effective communication <W>
7. All forms of written communication including <W> reports, notices, agenda notes, business correspondence preparation of summaries and press, telegrams <W> representations, press release and advertisements.
8. Telephonic communications <W>
9. Essentials of technical report writing, Defect reporting. Analysis and hour to make suggestions <W>
10. Writing personnel resume and application for a job <W>
11. Techniques of conducting group discussions <W>
12. International Phonetics of alphabets and numericals <W>

LIST OF PRACTICALS

1. Practice Sessions of Oral Communication by <w> Seminars on current topic debates and contests, <w> sessions

2. Practice of writing officia1 business and personal letters on each of the items given in Section 7 (8 Hr)

3. Practice of handling telephonic communication (3 Hr)

4. Practice of Technical Report writing (5 Hr)

5. Practice of writing personnel biodata and writing application for a job (4 Hr)

6. Practice Session on group discussion (6 Hr)

RATIONALE

Applied Mathematics forms the backbone of engineering students. Basic elements of algebra, trigonometry, coordinate geometry, differential ca1culus and integra1 calcu1us have been included in the curricu1um as foundation course and to provide continuing education base to the students.

DETAILED CONTENTS

1. Co-ordinate Geometry (9 Hr)

- Point : Cartesian coordinates, polar coordinate and their conversion to cartesian coordinates and vice versa (In two dimensions only).

- Distance between two points. Internal and External division formulae

- Area of a triangle when its vertices are given conditions of collirearity of points. To find the coordinates of centred, in centre of a triang1e given the vertices using the formula. Simple problems on locus.

- Straight line : Equation of straight line .in various standard forms. Inter section of two straight 1ines, ang1e between two 1ines.

- Perpendicu1ar distance formu1a

- Circle : Genera1 equation of a circ1e and its characteristics. To find the equation of a circle given (i) Center and radius (ii) Three points on it (iii) Co-ordinates of end points of a diameter .

- Concics : Definitie of conic section standard equation of parabola. Equation of parabola given its focus, and directrix. Given the equation of a parabola, determination of its focus, vertex, axis, directrix and latus rectum.

- Ellipse and hyperbola (standard equations without roof), writing equations given the directrix. Focus and, eccentricity; given the equation determination of focus, directix, latus rectum, axes, eccentricity and Vertex.

2. Vector Algebra

- Concept of a vector, vector in polar and cartesian systems. Expressing a polar vector in terms of cartesian unit vectors' and vice versa. Representation of a point by a vector.

- Arithmetic operations on vectors addition, subtraction, Multiplication of a vector by a scalar, scalar product of two vectors and. vector product of two vectors. App1ication of a point by a vector. Appllication in Mechanics and E1ectro-magnetism.

Matrix and Determinant (6 Hr)

Determinant and its evaluation, minor, co-factor, matrix and its simplification. Matrix multiplication, inverse; matrix. Solution of simultaneous equations containing upto unknowns only.

Differential Calculus **(8** Hr)

Function and Limits:

- Concepts of a function, its value and limit
- Evaluation of limits in case of four standard limits

$$\lim_{x\to 0}\frac{\sin(X)}{x} \qquad \lim_{x\to 0}(1+x)^{1/x} \qquad \lim_{x\to 0}\frac{x^n - a^n}{x-a}$$

$$\lim_{x\to 0}\frac{a^x - 1}{x}$$

Differentiation:

- Definition, its physical meaning as rate measure and its geometrical meaning as s1ope.
- Differentiation from first principles of x^n, a, log x, sin x, Cos x, tan x
- Dıfferentiation of sum product and quotient or functions
- Differentiation of function of a function
- Differentiation of sec x, cosec x, cot x and of inverse t-ratios
- Differentiation of implicit functions and paramatric equations
- Logarithmic differentiations
- Applications of Differentiation: Errors, maximum and minimum, tangent and normal.

Integral Calculus

(a) Indefinite Integrals :

Integration as inverse process of differentation. Simple integration by substitution, by parts and by partial fraction.

Definite Integrals :

Evaluation of definite integrals evaluation of (simple problems)

$$\int_0^{\frac{\pi}{2}} \sin x\,dx, \quad \int_0^{\frac{\pi}{2}} \cos^N x\,dx \text{ and } \int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\,dx$$

(m, n being positive "integer only)

Application : area bounded by a curve and axes- Volume of solid farmed by revolution of an area about axis.'

(b) Differential Equation :

Solution of differential equation of first order and first degree

(i) Homogeneous differential equation.
(ii) Linear differential equation.

BS 111 APPLIED PHYSICS .

RATIONALE

Applied physics is. a foundation course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. The course cover basics like instrument, waves, sound, light and 'atomic structure.

DETAILED CONTENTS-

1. Measurement (6 Hr)

a) Units and Dimensions

Fundamental and derived units, SI. units, dimensions of physical quantities, dimensional formula and dimensional equation, principles of homoqeneity of dimensions and applications of homogeneity principle in:

- Checking the Correctness of phyica1 equation.
- Deriving relation among variou physica1quantities.
- Conversion of numerica1 va1ues of physıca1 quantities from one system of units into other system

b) Errors in measurement accuracy, estimation of percentage error in the result of measurement.

WAVES (6 Hr)

Generation of waves by vibrating partic1es, progressive wave, equation of waves, energy transfer by particles and waves, superposition of waves and its applications to interference, beats and stationary waves (graphical); sound and light as waves - range of frequencies, wavelengths, velocities and their nature, electromagnetic spectrum Doppler effect.

3) Applications of Sound waves • (5 Hr)

a) Acoustic

Reflection., refraction and absorption of sound waves by materials; definition of pitch, loudness ,quality and intensity of sound waves, unıts of intensity (bel and decibel); Echo and reverberation time control of reverberation time Acoustic insulation ; (qualitative treatment <w> of reverberation.

b) Ultrasonic (5 Hr)

Production of ultrasonic waves by magnetostriction and piezoelectric effects, 'detection and propertise of <w> application <w> <w> <w> <w>cleaning, flaw detection and exploration (sonar).

]Light (9 Hr)

<L>
power of lens, characteristics of various types of lenses; principles of optical projectors, optical principles of OHP and slide film projectors.

Interference and diffraction of light waves; Interference of light waves; basic ideas about diffraction and polarization of light waves.

Laser and its Applications (5 Hr)

Laser principle, types of Lasers; study of the He-Ne and Ruby laser and their application.

Atomic Structure and Energy Level (6 Hr)

Bohr model of atomic structure, ionisation potentials; Energy levels, Energy band levels of conductors, insulators and semiconductors. Atomic and crystal structure of silicon and germanium, cava lent bonds, Effect of temperature on conductivity of germanium and silicon.

LIST OF PRACTICALS

1. Use of vernier calipers and micrometer for determination of diameter of a wire.

2. Study of interference of sound waves using Quincke's tube .

3. Study of resonance in air- column and determination of velocity of sound in air.
4. To make a, telescope by combination of suitable lenses and determine, its magnifying power.
5. Measurement of small thickness by interference method (by Fresnel's Biprism method)
6. To make a compound Microscope by suitable combination of 1enses and determine its magnifying power.

7. To determine the wavelength of sodium 1ight by Newton's ring method

8. Setting an OHP lenses and mirrors for its best performance

9. Determination of wavelength of various spectral lines of mercury lamp.

10. Measurement of illumination level of a white surface under: Natural daylight, incandescent light and fluorescent light.

11. To compare the intensity of illumination by Bunsen's photometer.

12. Study of: diffraction of. He-Me laser beam by markings on a vernire- scale and determination of its wavelength.

13. To measure the first ionisation potential of Ha using diode.

SUGGESTIONS

While teaching the subject, teacher should make maximum use of demonstration to make the subject interesting to the students.

4. ES 122 BASIC ELECTRICITY

L T P
3 – 2

RATIONALE

The course provides the student : (i) Understanding the "basic concepts and principles of DC and AC power; DC and AC circuits.(ii) Familiarisation with basic electrical circuits and devices (iii) Understanding the principles of working of various testing and measuring instruments and their effective use.

DETAILED CONTENTS

ELECTRQSTATICS

1. Review of following : (5 Hr)

a) Coulomb's law, Electric field, Electric intensity, Electric lines of force in simple charge configuration

b) Gauss's theorem (No proof) ; Field around a charged conductor, plane sheet and a sphere, concept of electric displacement current and displacement density.

c) Concept of potential difference, Potential due to a point charge; Equipotentia1 surfaces; potential difference.

2. Capacitor (4 Hr)

a) Concepts of capacitance and capacitance capacitor, Units capacitance capacitor ratings.

b) Parallel plate, spherical and cylindrical capacitor and their capacities.

c) Energy stored in a capacitor.

d) Concept of dielectric and its effect on dielectric constant, dielectric constant, dielectric break-down.

e) Series and parallel combination of capacitors. Simple problems of capacitors.

3. DC Circuits (8 Hr)

a) Concept and units of electric curent.

b) Ohm's 1aw, concepts of resistance, <w> resistivity and conductivity. Their hits and dependence on temperature in conductor .

c) Power and energy, heating effect of electric current and 'conversion of meachancial to electrical units and vice- versa .

d) Kirchoff's voltage and current laws and their applications in simple DC circuits.

e) Series and parallel .combination of resistors, wattage consideration, Simple problems.

4. Basic Magnetism. (3 H r)

Magnetic: intensity, and Magnetic flux and their units. Intensity of magnetisation; retentivity <w> hystersis loop.

5. Electro Magnetism (8 Hr)

a) Concept of magnetic field production by flow <w> current Oversted's experiment, concept of <w> motive force (MMF), permeability Analogy between electric and magnetic circuits.

b) Force on a moving charge and current in a magnetic field, force between two current carrying parallel conductors.

c) Magnetic field around a current carrying conductor, circular loop and solenoids.

d) Faraday's laws, Lenz'-s law and rules of electromagnetic induction principles, of self and mutual induction, self and -mutually induced, e.m. f; simple numerical problems.

e) Energy "stored in a magnetic, field, concept of current growth, decay and time constant in an inductive(RL) circuit .

f) Energy stored in an inductor, series and parallel combinations of inductors.

6. A.C. Theory (6 Hr)

Concept of alternating voltage and current, difference between AC and DC.

Concept of cycle, frequency, period, amplitude, instantaneous value, average value, rms value and peak value. Form factor (definition on1y)

Equation of sinusodial waveform, representation alternating quantities, concept of phase difference.

Cells and Batteries (3 Hr)

a) Types of cells and their uses; Basic constructional features of Nicket cadmium, Alkali and lead-acid; cell; main properties, difference between dry and wet cells, definition of standard cell and its application, Ratings and maintenance of cells.

b) Battery and battery ratings, charging and maintenance of batteries

Voltage and Current Source (4 Hr)

a) Concept of constant voltage source, symbol and graphical representation, characteristics of ideal and practical voltage sources

b) Concept of constant current source, symbol, characteristics and graphical presentation of ideal and practical current sources.

c) Equivalence of current and voltage source's

d) Concept of floating and .grounded d.c. power supplies

9. DC Circuit Theorems (8 Hr)

Thevenin's theorem, Norton's theorem, superposition theorem, Maximum power transfer theorem, application of network theorems in solving DC circuit problems.

LIST OF PRACTICALS

1. Verification of Ohm's Law

2.a Verification of Req = R_1 + R_2 + R_3 +…….in circuit, where are R_1 R_2, R_3…….. are in series.

b Verification of 1/Req = 1/R_1 + 1/R_2 +…….in circuit where R_1….R_2 are in parallel.

3. Verification of Kirchaff's first and second laws

4. To measure the (very low) resistance of ammeter and (very high) resistance of voltmeter

5. To measure resistance of galvanometer by half deflector method

6. Conversion of galvometer into (i) <w>.<w>.<w>.

7. To verify .in dc circuits:. (i) Thevenin's theorem theorem (ii) Norton's theorem (iii) Superposition theorem (iv) Maximum power transfer theorem

8. To varify In dc circuits (i) superposition theruem (ii) <w> transfer therum.

9. To measure inductance of ferrite core coil by first removing the core and then by inserting the core gradually to the full extent and observe the effect of flux concentration on value of inductance

10a. To verify Leq = L_1 +L_2 +...where inductances L_1 ,L_2 ....are connected in series

b. To verify l/leq = l/L_1 +1/L_2 +where inductances L_1, L_2 ...are connected in parallel

11a. To measure capacıtance of tuning capacitor by gradually turning the plates inside one another and to observe effect of different overlaps

12a. To verify Ceq = C_1+C_2 . . .where capacitances C_1,C_2 .... are connected in parallel.

b. To verify 1/Ceq = 1 /C_1+1C_2 +…… where capacitances C_1, C_2 <W> are connected in series.

13. Plot current and voltage growth and decay in R.L and <W> circuits for different time constants

physical explanations of the working of the <w> typical applications of each <W> Different type diodes; brief idea and typical applications of power <W> zener diodes; varactor diodes and point. Contact. Important specification of rectifier dioce and zener <w>.

4. Introduction to Biploar Transistor-

Concept of bipolar transistor as two junction three ter <W> kinds of current carries; PNP and transistors, their, symbols a mechanisms of current <W> explanation of fundamental current relations,

$$I_e = I_b + I_c$$

and

$$I_e = a I_e + I_{cbo}$$

Concept of leakage, current ICBO, effect of temperature leakage current CB, CE and CC configuration, Common configuration (CD) : Input and output characterist determination of transistor parameter input <W> dynamic resistance, current amp1ificatien factor. <W> emitter configuration : collector current relations in configuration, collector current in terms of base <W> and leakage current. (ICBO) relationship between the <W> current in CB and CE configuration input and <W> characteristics, determination of dynamic in and output resistances and current amplification factor from the characteristics. Common collector configuration expression of emitter current in terms, of the base <W> and leakage current in CC configuration Comparison of and CE configuration with regard to <W> input and <W> resistance, current gain and leakage current, performance CE configuration over CB configuration Transistor as amplifier in CE configuration. DC load line, its <W> and drawing it on collector characteristics. Determination of small signal voltage and currents gain of a <W> transistor amplifier using CE gain as product of the voltage <W> and current gain.

5. TRANSISTOR BIASING AND STABL1SATION OF OPERATING POINT

Different transistor biasing circuit for fixing operating point, temperature and <w> ‘Bdc’ operating point need for stabilization of operating point operating point in cut off and sat on <w> region performance of the amplifier.

Calculation of operation point for different circuits. Simple design problems on potential divider biasing circuit.

SINGLE STAGE TRANSISTOR AMPLIFIER. (6 Hr)

Single stage CE amplifier circuit with proper biasing components, AC load, line and its use in :

- Calculation of current and voltage gain of a Sinq1e amp1ifier circuit.
- Explanation of phase reversal of the output voltage with respect to input voltage .

- Explanation of phase reversal of the output voltage with respect to input voltage.
- Transistor hybrid low frequency model in CE configuration, 'h' parameters and their physical significance, typical values of the parameters.

- Expressions for voltage gain, current gain, input and output impedance for a single stage CE amplifier circuit in 'h' parameters, appropriate approximation.

7. FIELD EFFECT TRANSISTOR (FET) (6 Hr)

Construction, operation, characteristics and equivalent circuit; of JFET and its circuit app1ication.

Construction, operation, characteristics and equivalent circuit of MOSFET in depletion, enhancment modes and its circuit app1ications.

CMOS, advantage and application..

Comparison of JFET, MOSFET, BJT

Simple FET amplifier circuit and its working <w> (without analysis).

LIST OF PRACTICALS

Practice in the use of following e1ectronic instrument

Nultimeter-ordinary as well as electronic (analog/digital type)

Regulated power supply.

LF signal generator, CRO

1. Experiments to be Perforned

i) Measurement of voltage at var1ous setting (low and high voltages) of reulgated power supply by using <w> and digital multimeter.

ii) Measurement of voltage and current by loading the regulated power supply.

iii) To obtain various voltages like +15V + 5V and measure them with the help of analog and digital multimeter.

iv) Practice in the use of signal generator and CRO : measurement of d.c. and a.c. voltages, time period/frequency of sine/square wave using triggered sweep CRO

2. Identification and familarisation of passive components.

Experiments to be performed.

i) Measurement of resistors by and ordinary multimeter and an electronic nultimeter and their vertification on the basis of colour code & specification.

ii) Measurement of transformer turn ratio of a transformer and to note its specification.

iii) Note the variations in resistance by variation of:

and to note its specification.

(a) light on LDR (b) temperature on a thermistor

3. Semiconductor diode characteristics :

i) Identification of types of packages, terminals and ting different ratings using data books for various types of semiconductor diodes. (germanium point contact, silicon low power and high power and switching diodes.

ii) Plotting of forward V.I characteristics for a <W> P.N. Diode (silicon and germanium diodes).

4. Rectifier circuits using semiconductor diode measurement of input and output voltage and plotting of input and waveshape

i) half wave rectifier. (ii) fullwave rectifier, (iii) bridge rectifier diode circuits.

5. Plot forward and reverse V-I characteristics for a zener Diode.

6. Plot the waveshapes of a full wave rectifier with <W> Capacitor, series inductor, and pie filter circuit.

7. Ploting input and output characteristics and calculation of Parameters of a transistor in common base configuration.

8. Ploting input and output characteristics and calculation of Parameters of a transistor in common emitter configuration.

9. Transistor biasing circuit. Measurement of operating point (IC and VCE) for a:

   i) fixed bias circuit (ii) potential divider biasing circuit.

   (Measurement can be made by changing the transistor in the circuits by another of same type number).

10. Single stage common emitter amplifier circuit.

   i) Measurement of voltage gain at 1 KHz for different load resistances.

   ii) Measurement of input and output impedance of the amplifier circuit.

11. a) Plot the FET characteristics and determine the FET parameters from its characteristics.

b) Measure voltage gain and plot the frequency response of JFET or MOSPET amplifier circuit.

ES 126 WORKSHOP PRACTICE I

	L	T	P
Hrs/week	-	-	6

RATIONALE

This subject is gateway to the technological/industrial Processes. The mental and manual abilities will be developed to handle engineering materials with hand tools with quality and Safety consciousness. The elementary abilities developed in carpentry, fitting, sheetmetal and jointing shops will find applications in the practice of this profession. The emphasis seven on practical work will provide the students the primary Experience of working in team.

DETAILED CONTENTS

The following trades are considered basic.

1. Carpentry
2. Fitting
3. Sheet Metal & Jointing.

1. CARPENTRY SHOP (40 Hr)

Keeping in view the essential elements of knowledge and skill, the following exercises are planned:

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1. Introduction to raw materials, various hand tools and safety measures to be observed.
2. Exercise on Marking and Sawing.
3. Planning Practice.
4. Chiselling practice.
5. Introduction of joints, their relative advantages and uses.
6. Preparing of half lap joint.
7. Preparing of mortise and tennon joint.
8. Preparation of dovetail joint.
9. Preparation of mitre joint.
10. Demonstration job showing use of rip saw, bow saw and Trammel.
11. Demonstration of job on band saw, circular saw.

2. FITTING SHOP

1. Common materials used in fitting shop and description of work bench, holding devices and files.

2. Filing practice (production of flat surfaces). Checking by straight edge.

3. Filing a dimensioned rectangular or square piece to an accuracy of ± 0.25 mm.

4. Description of chisels, hammers etc. and chipping practice

5. Simple operation of hacksawing, description of various types of blades, their uses and how to fit the blade and Hacksawing practice.

6. Description of drills, selection of drills for tapping, types of taps, tapping and dieing operations.

7. Drilling practice on soft metals (Al, Brass and lead).

8. Handling of measuring instruments, checking of zero error, finding of least count etc.

9. Practice of filing on non ferrous metal.

3. SHEET METAL & JOINTING SHOP (40 Hr)

1. Introduction to sheet metal shop, use of hand tools and accessories, e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowances required during job fabrication. Selection of material.

2. Demonstration of the use of hand shears, sheet metal machines, creasing and grooving tools.

3. Preparation of a sheet metal job involving rolling shearing, creasing, binding, corner making and round cutting

4. Preparation of a sheet metal jobs involving shearing, grooving, greasing, circle cutting folding beading, etc.

5. Different types of rivets and their applications. Use of puncher and pullers.

6. Practice of riveting in different fashion e.g. lap, butt, chain, zig-zag etc.

7. Preparation of utility jobs.

8. Introduction to soldering and brazing and; Demonstration on brazing by the Instructor.

7. BS 210 APPLIED MATHEMATICS-II

L T P
Hrs/week 3 2 4

RATIONALE

Applied Mathematics forms the backbone of Engineering Students. In : continuation of topics covered in applied mathematics I, elements of differential equations, fourier Series, laplace transform, complex numbers and partial differentiation has been including in the curriculum as a foundation course to comprehend advanced analysis and theory of the fields of electronics.

DETAILED CONTENTS

1. Differential Equation of Second Order : (8 Hr)

   - Solution of differential equations of second order having e^{ax}, e^{ax}, sin ax, cos ax and x^n in the right hand side.
     Solution of R-L-C circuits.

2. Fourier Series : (8.Hr)

   Periodic function, equation of waves, determination of fourier co-efficients, expansion of a periodic function by fourier series. Functions defined in two or more subranges.

3. Laplace Transform (8.Hr)

   Definition, transforms of elementary functions, Properties of laplace transforms. Inverse transforms, transforms of first and second derivatives. Solutions of differential equations using laplace transforms. Transforms of integrals Solution of RL, RC and R-L-C circuits.

4. Complex Number : (8.Hr)

   Complex number in exponential form. Euler's exponential forms. Hyperbolic functions, Relation between hyperbolic and circular function.

   Phasor, addition of sinusoidal term, phasor diagrams of R-L, R-C, R-L-C circuits. Impedance and admittance as complex numbers. Solution of simple R-L-C circuits including bridge circuits.

5. Partial Differentation : (8.Hr)

   Partial derivative of first and higher orders. Homogeneous function, Euler's theorem on homogeneous function. Total differentiation.

8. ES 222 **ELECTRICAL ENGINEERING**

L T P
3 - 2

RATIONALE

The nature of jobs an electronic technician has to perform varies widely. Any electronic system (i.e. tape recorder, VCR, TV receiver) is a combination of electronic circuits and electrical components (e.g. small electrical motor, different types of switches etc.) In order to carry out his job function effectively, apart from the knowledge and skills of electronics, he must possess sound knowledge about basic principles off working of electrical machines and equipment. The practical work done in this subject will help in developing skills of operating, repairing and testing of electrical machines and components (e.g. small electrical motor, transformer etc)

DETAILED CONTENTS

1. Measuring Instruments (2 Hr)

a) Working principles and construction of Ammeters and voltmeters (moving coil and moving iron type)

b) Difference between ammeter and voltmeter, extension of their range and simple numerical problems.

c) Principle and working of :

- wattmeter (dynamo-meter type)
- Energy meter (induction type)

2. Generalised Treatment of Electrical Machines (4 Hr)

a) Introduction.

b) Definition of motor and generator.

c) Basic principle of a generator and a motor

d) Torque due to alignment of two magnetic. Fields and the concept of Torque angle.

e) Basic Electromagnetic laws.

f) E.M.F. induced in a coil rotation in a magnetic field

g) Elementary concept of an Electrical Machine.

h) Common features of rotating electrical machines.

3. Three Phase Supply (3 Hr)

a) Advantage of three phase system over single phase system

b) Star Delta connections

c) Relation between phase and line voltage single phase system and three phase system

d) Power and power factor in three phase system and their measurements

4. DC Machines (8 Hr)

a) Main constructional features, principle of working.

b) Function of the commutator for motoring and generating action

c) Armature winding

d) Factors determining induced e.m.f.

e) Factors determining Electromagnetic torque

f) principle s of generating and matoring

g) Action and relationship between termina1 voltage and induced e.m.f

h) Factors determining the speed of a DC motor

i) Different types of a excitation

j) Performance and characteristics of different types of DC machines

k) Starting of DC machines, motors and starters

l) Application of DC machines

5. Transformers (8 Hr)

a) Principles of operation and constructional details of sing1e phase and three phase transformer. core type and shell type ransformers, difference between single phase and three phase transformers and advantages and disadvange

b) Voltage Regulation of a transformer

c) Losses in a transformer

d) Efficiency, condition for maximum efficiency and all day efficiency

e) Auto transformers and instrument transformer

6. A.C. Motors (8 Hr)

a) Brief introduction about three phase induction motors, its principle of operation

b) Types of induction motors and constructional features of squirrel cage and <W> motors

c) Starting and speed control: Star Delta and DOL (Direct on-line) starters

d) Reversal of direction of rotation of 3 motors

e) Applications of induction motors

f) Introduction to synchronous motors and their applications

7. Single Phase and Fractional Kilowatt Motors (6 Hr)

a) introduction
- Principle of operation of single phase motors
- Types of single phase induction motors and their constructional details(i.e.) split phase, capacitor start, capacitor start and run, shaded pole and reluctance start)

b) Single phase synchronous motor-reluctance motor (hyrteresis motor)

c) Commutator type single phase motors Repulsion Induction motor shaded pole motors, AC series motor and universa1 motors

d) Introduction to servo-motors and stepper motors.

LIST OF PRACT ICALS

1. Conversion of Galvanometer into Ammeter and Voltmeter

2. To measure power and power factors in a 3 phase system with

a) balanced load
b) unbalanced load by the two wattmeter method and any one other method

3. To find the value of capacitance and power factor of a capacitor by approximate method.

4. To draw the equivalent circuit of a transformer and to determine efficiency and regulation by performing:
   a) Open circuit test
   b) Short circuit test

5. To measure the induced e.m.f. of a separately excited d.c generator as a function of field current eg/If

6. To measure the terminal voltage of a separately excited dc motor as a function of load current

7. To measure the terminal voltage of a.d.c. shunt generator as a function of load current

8. To measure the speed of a separately excited dc. motors a function of load torque at rated armature voltage

9. To measure the speed of a separately excited dc motor as a function of load torque at rated armature voltage

10. To measure the speed of a dc series motor .as a function of load torque at rated armature voltage

11. To determine the efficiency of a dc shunt motor by the measurement of losses (Sunburn's method)

12. To observe the difference in the effect of switching on a single phase capacitor start induction motor with

    a) the capacitor disconnected and
    b) the capacitor connected

    Also to determine how to reverse the direction of rotation

9. ES 223 INTRODUCTION TO COMPUTERS

L T. P
1 - 6

RATIONALE

Information technology and computers have great influence on all aspects of our' life. All our workplaces and the living environment are being computerized. In order to prepare the diploma holders to work in these environments and contribute to them, it is essential that they are exposed to this area of work or study. This exposure will enab1e the students to enter the world with confidence, live in these environments in a harmonious way and contribute to the productivity.

DETAILED CONTENTS

1. Introduction to Computers : (15 Hr)

(i) Block diagram of a computer& overview of its working.

(ii) Interconnections. of various pheripherals with computers.

(iii) Input/output & secondry storages devices.

(iv) Classification of programming 1anguages.

(v) Classification of computers.

2. FAMILIARIZATION WITH OPERATING SYSTEM (15 Hr)

(i) Introduction to computer operating system (DOS, windows 95).

(ii) Introduction to DOS structure, system fi1es <W> files & configuration files.

(iii) Booting the system from floppy hard disk.

(iv) Brief introduction to DOS internal & external commands.

(v) Fami1arisation with windows structures, its use & app1ication.

3. PREPARATION OF DOCUMENTS THROUGH WORD PROCESSING (30 Hr)

3.0 Idea of text editors like microsoft word. <w> etc.

3.1 Opening a document

3.2 Preparing documents inserting diagrams & tables

3.3 Editing document

3.3.1 Character, word and Line Editing

3 3.2 Margin Setting, Paragraph alignment

3.3.3 Block operations

3.3.4 Spell checker

3.3.5 Saving a document

3.4 Printing a document

4. INFORMATION PRESENTATION FOR DECISION MAKING US ING SPREAD SHEET (Excel/Lotus 1-2-3 ') (20 Hr)

4.1 Applications of spread sheet

4.2 Structure of spread sheet

4.3 Preparing spread sheet for simple data and numeric operations

4.4 Using formulae in spread sheet operations

4.5 Making tables, sorting and 'querying

4.6 Creation of graphs, Pie charts, bar charts .

4.7 Printing reports

5. COMPUTER AIDED DRAFTING (20 Hr)

5.1 Making simple drawings using features of CAD & Conforming the drafting specifications
5.2 Saving and retrieving drawings
5.3 Dimensioning
5.4 Lettering
5.5 Plotting drawings

10 EX 220 ELECTRONICS COMPONETS AND MATERIALS

L T P
<W>

RATIONALE

The study of Electronic Components and Materials is important from the point of view of manufacturing, testing and maintenance of electronic devices and systems. Students should understand the construction, identification, characteristics, specifications, merits, limitations and applications of electronic components and materials

DETAILED CONTENTS

1. Materia1 : (30 Hr)

Classification of materials into conducting semiconducting and insulating materials through a brief reference to atomic structure.

Conducting Materials:

- Resistcity and factors affecting resistivity such as temperature, alloying and mechanical stressing

- Classification of conducting materials into low resistivity and high resistivity materials. Some examp1es of each and their typical applications.

Insulating Materials:

- Electrical properties — volume res1st1v1ty, surfacc resistance, dielectric loss, dielectric strength (breakdown voltage) and dielectric constant

- Thermal properties Heat resistance, classification according to temperature endurance, thermal conductivity

- Plastics - classification into thermo plastic and thermo-se11ing categories; examples of e ach and their typical applications

- Important relevant (electrical, mechanical and thermal) characteristics and applications of the following materials

Mica	paper (dry and impregnated)
Asbestos	rubber
Ceramic	Silicon rubber
Class	PVC
Cotton	Polyester
Jute	Polythene
teflon	

Acrylics	
Silicon grease	
Bakelite	Phosphor Bronze alloy
Epoxy Glass	Beryllium – copper alloy
Varnish	Soldering Lead alloy
Lacquer	Copper
Enamel	Silver, Gold

Magnetic Materials:

- Different magnetic materia1s; (Dia, para, ferro) their properties

- Ferromagnetism, Ferrimagnetism, domains, permeability, Hysteresis loop (including coercive force and residual magnetism and magnetic saturation)

- Soft and hard magnetic materials, their examples and typical app1ications

2. Components (28 Hr)

- Capacitor Polyster, Metallised Polvster ceramic paper, mica and electrolytic types, construetiona1 details and testing, specifications, temperature and frequency stability and other limitations. Mutual comparison.

- Resistors-carbon film, metal film, carbon composition wire wound and variable types (presents and potentiometers) Constructional details and testing, specifications, temperature and frequency dependence and noise considerations. Mutual comparison

- Transformers Inductors and RF Coils: method or manufacture of inductors, RF coils and small transformers (up to 1 KVA) and their testing. Properties of cores. Need and types of shielding

- Surface Mounted Devices (SMDs)

- Connectors, Relays and Switches:

a) Various types of switches, e.g. slide, rotary, push, toggle, micro-switches etc. Their symbols, specifications and applications

b) Concept of ‘make’ and ‘break’ contacts in relays. Operating current, Holding crept. Various of relays Their symbols, specifications <W> applications

c) Various types of connectors. Their symbols, specifications and app1icat1ions

L T P
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RATIONALE

Engineering Drawing known as the language of engineers is a widely used means' of communication among the designers, engineers, technicians, draftsmen and craftmen in the industry. The translation of ideas into practice' without the use of this graphic language is rea11y beyond imagination. The diploma holder is required to read and interpret the design , and drawings, provided to him for actual execution of the job. This course aims at buid1ing foundation for comprehension of this language of engineering profession.

DETAILED CONTENTS

Introduction to instruments & materials used in drawing.
Plate No.1:Free.'hand sketching
Plate No.2:Coventiona1 representation of lines,
materials, breaks, electric and electronics symbols.
Plate No. 3: Free hand lettering & numerals in 3,5,8, &12

mm series Vertical & inclined lettering at 75
Instrumental single stroke lettering in 12 mm.
Plate No.4 : Dimensioning techniques.
Plate No. 5 : Three views of an objects in 1st angle projection.
Plate No.6 : Six views of an object in 1st angle projection.
Plate No.7 : Six views of an object in third angle projection.
Plate No.8 : Six views of an object in third angle projection
Plate No. 9 : Identification of surfaces from different objects including inclined & curved surfaces.
Plate No. 10 : Sections-conventional representation of materials, general conventions of revolved & removed sections.
Plate No. . 11 : Representation of pictorial/isometric view of a simple object.
Plate No. 12 : Isometric views of simple objects including slant curved surfaces.
Plate No. 13 : Isometric of a circle, semicircle, arcs &angles.
Plate No. 14 : Missing views & lines.
Plate No. .15 : scales, diagonal scale, scale of chords.

12. EX 221 workshop practice-II

L T P
- - 8

RATIONALE

This subject is gateway to the technology/industrial processes. The mental ‘and manual abilities will be developed handle engineering materials with hand tools with quality a safety consciouness. The elementary abilities developed carpentary, fitting, sheetmetal and jointing shops earlier and in electric & electronics shops during this study will find applications in other subjects. The emphasis given on practical work will provide the students the primary experience of work) in team.

DETAILED CONTENTS

ELECTRICAL SHOP (52 Hr)

1. Electrical Safety Rules. During the first session all students must learn important safety rules, precautions and measures against fire hazards due to Electrical fault and treatment against electric shock

2. Identification of commonly used electrical engineering materials. During these turns students must learn about different types of insulators, conductors (types of wires, cables etc.) and magnetic materials. They should be shown these materials in Electrical workshop and also told the typical applications

3. Familiarisation with Domestic Wiring: Some simple exercises should be done by students in the electrical workshop. Three such exercises are given below:

   a) Wiring of a mains outlet panel consisting of specified combination of 15 amp, 15 amp sockets, mains switch, indicator lamps and fuse links.

   b) Wire a fluorescent lamp to AC main alongwith the switch, starter and the choke

   c) Wire, a door bell.

ELECTRONIC SHOP (60 Hr)

1. Identification and fami1iariasan with the follow electronic instrument :

   a) Multimeter digital(three and half digit,

   b) Single team simple CRO function of every knob on the

front panel

c) Audio-oscillator sine and square wave output

d) Power supply fixed voltage and variable voltage, single output as well as dual output.

2. Practice in the use of above mentioned equipment a small experiment may be done by them so that they can just use of them

3. Identification and fami1iarisation with commonly used tools; statement of their uses. Identification and familiarisation with active and passive components; colour code and types of resistor and potentiometers (including VDR, LDR and thermistor); some small practical exercises on measurement of these components; identification of diode and transistor terminals. Identification of other components including LED, LCD, UJT, FET , Coils, relays, switches (SPDT, DP DT, etc) connectors, microswitches, read relays, transformers (mains, audio and RF, etc) Linear and Digital IC s, Thyristors, etc.

NOTE: Demonstration Boards for the above components should be made

4. Cut,. strip, join and insulate two length of wires/cables (repeat with different types of cables/wires)

5. Cut, strip,connect/so1der/crimp different kinds of wires/ cables (including shielded cable) to different types of power'/general purpose/Audio Video/Telephone plugs, sockets, jacks, terminals, binding posts, terminals strips, connectors. The tasks should include making complete recording/p1ayfcack/Antenna/Speaker leads for common consumer electronic products such as Radio, TV, VCR, Cassette Recorder, Hi-Fi equipment, Head set, microphone

6. Cut, bend, tin component, leds, inserts and solder components (resistor, capacitor, diodes, transistors, IFT type coils, DIL, ICs etc) on a PCB

7. Wiring of. a small circuit on a PCB/tag strip tag strips involving" lacking, sleeving arid use of identifier tags

8. Desolder, remove and clean all the 'components, wires, from a given equipment, APCB or a tap strip

9. Soldering Iron

10. Temperature Control Soldering Iron

11. Desoldering pump

12. Desoldering strip

13. Exposure modern soldering and desoldering processes
14. Field visits

15. Demonstrate (or explain) the joining (or connecting) methods or/and mounting and dismantling method as well as .uses of the items mentioned below:

    a) Various types, of single, multi cored insulated screened pour Audio video, general; purpose wires/cables

    b) Various types of plugs, sockets, connectors suitable for,-, general purpose audio video use. Some of such connectors area: 2 and 3 pin mains plug, and sockets,

       Banana plugs, and-sockets, BNG, RCA, DIN, UHF, Ear phone speaker connector, telephone jacks and similar male and female connectors and terminal strips.

    c) Various types of switches' such ass normal/miniature toggle, slide, push button piano key, rotary, SPST, SPPT, DPST, DP DT, band selector, multiway Master Mains Switch.

    d) Various types of protective devices such as: Wire fuse, cartridge fuse, slow acting/fast acting fuse, HRC fuse, thermal' fuse, single/multipole miniature circuit breakers, over and under current relays.

16. Demonstrate the skill to make faultless solder joints

17. Demonstrate the skill to remove components/wires by unsoldering

18. Demonstrate the skill to assemble, components on boards, chassis tape strips

19. Explain (or demonstrate), various method' making and laying of cable forms, wiring techniques

Suggest ions for Achievement of Objectives

For making students fami1iar with electronic components as .well as passive), tools, accessories, equipment (active as well passive; tools, accessories, equipment (listed as above) tutorial lessons should be used. The students must be taken to electronics laboratory and taught rating limitations, symbol, connection procedures, practice period should be used for gaining physical examination, testing, wiring, mounting, connecting .jointing exercises. General purpose equipment listed above should be operated and used by them. Such parameters an amp1itude, frequency phase, time period, rise and fa11 time of pulse waveforms , transistor parameters , circuit resistance should be measured by students in the laboratory.

The situation requiring the use of low power and high power soldering irons and tips should be discussed and should be a part of training.

The use of de-soldering wick, desoldering tool, solder sucker, desoldering of ICS and multipin components need Variety of soldering exercises involving different and cables should be included as practical work.

13. EX 330 PRINCIPLE OF COMMUNICATION ENGINEERING

L. T P
3 - 2

RATIONALE

The study of principles of communication systems leads to further specialized study of audio and video systems, line communications and microwave communication systems. Thus the diploma-holder in Electronics and Communication Engineering shall find employment in areas of R and D, production, servicing maintenance of various communication system.

The students should understand the advantages limitations of various analog and digital modulation systems on a comparative scale and relate to them while studying practical communication system.

DETAILED CONTENTS

1. Introduction: (1 Hr)

   a) Need for modulation and demodulation in communication systems.

   b) Basic scheme of a modern communication system.

2. Amp1itude Modulation (3 Hr)

   a) Derivation of expression for an amplitude modulation wave. Carrier and side band components. Modulation index, Spectrum and BW of AM Wave. Relative power distribution in carrier and side bands.

   b) Elementary idea of DSB, DSAB-SC, SSB-SC, ISB and VSB modulations, their comparison, and areas of applications.

3. Frequency Modulation: (3 Hr)

   a) Derivation of expression for. frequency modulated wave and its frequency spectrum (without proof and analysis of Bassel function) Modulation index, maximum frequency deviation and deviation ratio, BW and FM signals, Carson's rule.

   b) Effect of noise on FM carrier. Noise triangle. Need for pre emphasis and de-emphasis ,capture effect.

   c) Comparison of FM and AM in communication system

4. Phase Modulation - (2 Hr)

Derivation of expression for phase modulated wave, modulation index, comparison with frequency modulation

5. Principle of AM Modulators: (4 Hr)

Working principles and typical application os :
- Collector modulator
- Base modu1ator
- Balanced Modulator

6. Principles of FM Modulators (4 Hr)

Working principles and applications of reactance modulator; varactor diode modulator, VCO and Armstrong phase modulator. Stabilisation of carrier for using AFC (block diagram approach)

7. Demodulation of AM Waves (3 Hr)

a) Principles of demodulation of AM wave using diode detector circuit; concept of diagonal clipping and formula for RC time constant for minimum distortion (no derivation)

b) Principle of demodulation of AM Wave using synchronous detection.

8. Demodulation of FM Waves: (6 Hr)

a) Basic principles of FM detection using slope detector

b) Principles of working of the following FM demodulator;

- Foster-Seeley discriminator
- Ratio detector
- Quadrature detector
- Phase locked Loop (PLL) Fm demodu1ators

9. Pulse Modu1ation (7 Hr)

a) Statement of sampling theorem and elementary idea of sampling frequency for pulse modulation

b) Basic concepts of time division mu1tlp1exing (TDM) and frequency division multiplexing (FDM)

c) Basic ideas about . PAM, PPM, PWM and their <w> applications

d) Pulse code Modulation (PCM) basic scheme of PCM system Quantisation, Quantization, error, companding, block diagram of TDM-PCM communication system and function of

each block. Advantages of PCM systems. Concepts of differential PCM (DPCM)

e) Delta Modulation (DM)

Basic principle of delta modulation system, advantages of delta modulation over PCM system. Limitationfs of delta modulation, Concept of adaptive delta, modulation (ADM)

LIST OF PRACT ICALS .

1. a) To conserve an AM wave on. CRD produced by a standard signal generator using internal and external modulation

   b) To measure the modulation index of the wave obtained in above practical

2. a) To obtain an AM wave from a collector modu1ator circuit, and observe the AM pattern on CRD

   b) To measure index of modulation of the AM signal for different levels of modulating signal

3. To obtain a FM wave from reactance tube modulator/voltage controlled oscillator circuit and measure the frequency deviation for different modulating signals.

4. To obtain modulating signal from an AM detector circuit and observe the pattern for different RC time constants and obtain its optimum value for least distortion

5. To obtain modulating signal from a FM detector (Fasterseely/Ratio detector/quyadrature/IC) circuit and plot the discriminator characteristics.

6. To observe the sampled signal and compare it with the analog input signal. Note the effect of varying the sampling pulse width and frequency on the sampled output

7. verify the sampling theorem

8. To time division multiplex the two given signals

9. To observe and note the pulse modulated signals (PAM, PPM, PWM) and compare them with .the corresponding analog input signal

10. To measure the quantization noise in a 3 bit/4 coded FCM signa1

11. To feed an analog signal to a PCM modulator and compare the demodulated signal, with the analog input, also note the effect of low pass filter at the demodu1ation output
12. To study the process of delta modulation/demodulation.

14 EX 331 DIGITAL ELECTRONICS

L T P
3 1 3

RATIONAL

This syllabus has been designed to make the students know about the fundamental principles of digital electronics and gain familiarity with the available IC chips. This subject aims to a background in the broad field of digital systems design microprocessors

DETAILED CONTENTS

1. Introduction (1 Hr)

   a) basic difference between analog and digital signal.

   b) Application and advantages of digital signals.

2. Number System: (4 Hr)

   a) Binary and hexadecimal number system; conversion from decimal and hexadecimal to binary and vice- versa. BCD representation.

   b) Binary addition, subtraction, multiplication and division including binary points. BCD addition.
   1's and 2's complement method of addition/subtraction

3. Logic Gates (4 Hr)

   a) Concept of negative and positive logic

   b) Definition, symbo1s and truth tab1e of NOT, AND, OR NAND NOR EXOR Gates. NAND and NOR as universal gates.

4. Logic Simplification (4 Hr)

   a) Postulates of boolean algebra, DE Morgan's Theorems, Various identities. Formulation of truth table and boolean equation for simple problem. Implementation of Boolean (logic) equations with gates

   b) Karnaugh map (up to 4 variables) and simple application a in developing combinational logic circuits

5. Logic Fami1ies (5 Hr)

   a) Logic fami1y c1assification :

      - Definition of SSI, MSI, LSI, VLSI
      - TTL and MOS f ami1ies & their subc1assification.

- Characteristics of TTL an d MOS digital gates delay, speed noise margin, logic level, power dissipation, fan-in, fan-out, power supply requirement and comparison between TTL and MOS families.
- Interfacing TTL and MOS ICs.

b) Logic Circuits: (3 Hr)

Open collector, wired OR and totem pole output circuit operation (qualitative) for a TTL NAND gate

- MOS circuit operation for a standard gate (NOR)

c) Tristate Switch / Buffer

6. Codes and Parity (4 Hr)

a) Concept of code, weighted and non-weighted codes examples of 8421, BCD, excess-3 and Grey code.

b) Concept of parity, single and double parity and error detection

c) Alphanumeric cades: ASCII & EBCDIC

7. Arithmetic Circuits (2 Hr)

a) Half adder & Full adder circuit, design and imp1ementation.

b) Half & Full subtractor circuit, design and imp1ementation.

c) 4 bit adder/subtractor.

8. Decoders,Disp1ay Devices and Associated Circuits (3 Hr)

a) LED, LCD, seven segment display, basic operation of various commonly used types

b) Four bit decoder circuits for 7 segment display and decoder/driver ICs.

9. Multiplexers and De-mu11ip1exers (3 H r)

Basic functions and block diagram of MUX & DEMUX. Different types

10. Latehes and Flip F1ops (4 Hr)

a) Concept and types of latch with their working and applications
b) Operation using waveforms and truth tables of RS, T, D, JK, Master/Slave JK flip flops.
c) Difference between a latch and a flip flop

4 4 bit adder/subtractor circuit

Construct ion of a 4 bit adder 2's –complement subtractor circuit using an 4 bit adder IC and an EX-OR IC and verify the operation of the circuit

5. IC Flip-flop

Verification of truth table for some positive edge triggered, negative edge triggered, level triggered IC flip- flops (At least one IC each of D latch. D flip-flop, edge triggered JK and master slave JK flip-flops)

6. Display devices and their decoder/drivers:

Familiarisation and use of different types of single LEDs, common anode and common cathode seven segment LCD displays

Use of '47',' '48' (or equiva1ent) decoder/driver ICs for 7 segment dis1ays

7. Tristate gate ICS:

Verification of truth table and study the operation at tristate buffer IC '126 or equivalent

Construct ion of a 4/8 bit bidirectional bus by using an appropr1ate IC

8. Decoder, encoder, mu1tip 1exerand demultiplexer

- Verification of truth table for one/two each of encoder and decoder ICs
- Verification of truth table for one/two each of multiplexer and demultiplexer ICs

9. Shift register

- construction of a 4 bit serial-in-serial-out/serial-in-parallel-out right shift register using JK flip flops and verification of its operation.

- Construction and testing for its operation of a 4 bit ring counter using JK flip flop

10. Universal shift Registers IC

Verification of truth table for any one universal shift register IC

11. Asynchronous Counter ICs

- Use of 7490 equivalent TTL (a), divide by 2 (b) divide by 5 (c) divide by 10 counter

11. Counters (6 Hr)

a) Binary counters
b) Divide by N ripple counters (inc1uding design), Decade counter
c) Presettable and programmable counters
d) Down counter, up/down counter
e) Synchronous counters (only introduction)
f) Difference between Asychronous and Synchronous counters
g) Ring counter with timing diagram

12. Shift Register (4 Hr)

a) Introduction and basic concepts including shift left and shift right.
b) Serial in parallel out, seria1 in .serial out, parallet in serial out, parallel in parallel out.

13. MEMORIES (3 Hr)

Basic RAM cell, N x M bit RAM. Expansion of wordlength and capacity, static and dynamic RAM, basic idea of , ROM. PROM, EPROM and EEROM.

14. A/D. and D/A CONVERTERS (3 Hr)

General principle of A/D and D/A conversion and brief idea of their appl1ications. Binary resister network and resister ladder network methods of D/A conversion. Dual slope and successive approximation types of ADCs.

LIST OF PRACT ICALS

1. AND, OR, NOT, NAND, NOR and EX-QR ICs

Verification and interpretation of truth tables for AND, OR, MOT NAND, NOR and Exclusive OR (EX-QR) gates

2. Logic functions using Universal gates:

- Rea1isation of logic functions with the help of NAND or NOR gates

- Construction of a NOR gate latch and verification of its operation

3. Half adder and Full adder Circuits:

- Construction of half adder using EX-OR and MAND gates and (verification of it s operation
- Construction of a full adder circuit using EX-0R and MAND gates and verify its operation

- Use of 7493 equivalent or TTL (a) divide by 2 (b) , by 8 (c) divide by 16 counter

12. To construct and test 4/8 bit D/A converter using IC.

13. To construct and test 4/8 bit A/D converter using IC.

Note: The students should be exposed to different digital IC's, related to the experiments and the data book**.**

15. EX.332 NETWORK, FILTERS AND TRANSMISSIO LINES

L T P
3 - 4

RATIONALE

The study of networks, filters and transmission lines leads understanding of lines communication, audio and video communication, and microwave communication. Particularty they of networks takes off from principles of A.C. theory and introduces the student to parameters and characteristics of various networks, including filters. Also the study of transmission lines becomes important as its analogy is used in study of transmission of plane electromagnetic waves in bounded dedia.

DETAILED CONTENTS

1. Networks (10 Hr)

Two port (four terminals) network : Basic concepts following terms:

- Symmetrical- and asymmetrical networks; Balanced and unbalanced network; T-network, Pi network, ladder network; Lattice network; L-network and Bridge T-network

b) Symmetrical Network:

- Concept and significance of the terms characteristics impedance, propagation constant, attenuation constant, phase shift constant and insertion loss.

- Expression for characteristics impedance, propagation constant, attenuation constant and phase shift constant in terms of Zo, Zoc for the fo1lowing:

  - T network
  - Pi network

C Asymmetrical Network

- Concept ‘and significance of iterative impedance, image impedance, image transfer constant and insertion loss.

- The half section (1-section); asymmetrical T and Pi sections into half sections, derivation of iterative impedance, image impedance. Open and short circuit impedance of half section.

2. Attenuators (2 Hr)

a) Units of attenuation (decibles- and Nepers); General characteristics of attenuators

b) Analysis and design of simple attenuator of following types; Symmetrical T and Pi type, L type

3. Filters (12 Hr)

a) Brief idea of the use of Inter networks in different communication system. Concept of low pass high pass, band pass and band stop filters. Basic response of Butterworth, Chebychev and Cauer type filters

b) Theorem connecting attenuation constant and characteristics impedance . (Zo); determination of cut off frequency, constant K section

c) Prototype filter section:

- Reactancevs-frequency characteristics of a low-pass filter and its significance

- Attenuation Vs frequency; Phase shift Vs frequency, characteristics impedance Vs frequency of T and Pi curves and their significance

- Simple design problems of prototype low pass section.

d) M-Derived Filter Sections

- Limitations of prototype filters, need derived filters

- Expressions for main terms of fc (cut off frequency) and foo (frequency at which attenuation is infinity) for 1ow pass and high pass fillers.

- Simple design problems of m-derived low pass and high pass filters

- T and Pi high pass filter section:

  - reactance frequency curve of a high pass prototype filter and its significance

  - Plots of attenuation, phase shift, characteristic impedance of T and Pi sections with frequency and their significance.

  - Simple design problems of prototype.

e) Impedance Matching of Filters:

- Impedance matching, half section
- Terminating half sections
- Design prob1ems of composite simple filter

f) crystal Filters

Crystal and its equivalent circuits. Special properties of piezoelectnic filters and their use

g) Active Filters

Basic concept of active filters and comparison with passive filters. Simple design problems on Low pass, and High pass first and second order Butterworth filter

4. Transmission Lines (15 Hr)

a) Transmission lines and their applications; shapes of different types of transmission lines; (including 300 ohms antenna feeder cable, 75 ohm co-axial cable)

b) Distributed (or primary) constant of a transmission line, equivalent circuit of an infinite line, T and Pi type; representation of a section of transmission line.

c) Definition of characteristic impedance of line; concept of short line termination in Zo; currents and voltage along an "infinite line, propagation constant, attenuation and phase shift constant of the line

d) Relationship of characteristic impedance, propagation constant attenuation constant and phase constant in terms of distributed constants of the line

e) Conditions for minimum distortion and minimum attenuation, of signal on the line; necessity and different methods of loading the communication lines
(No derivations)

f) Concept of reflection and standing waves on a transmission line; definition of rflection coefficient in terms of characteristics impedance and load impedance, definition of standing wave ratio (SWR), re1ation between VSWR and Vo1tage reflection coefficient, maximum impedance on a line in terms of characteristics impedance and VSWR

g) Transmission line equation; expressions for voltage, current and impedance at a point on the line for lines, with and without losses. Expression for Input impedance of the 1ine (No derioations)

h) Input impedance of an open and short circuited line and its graphical representation

i) Transmission line at high on frequency, effect of high frequencies on the losses of a transmission line; Application of transmission lines as a reactive component and impedance transformer (e.g. Quarter wave transformer)

j) Principle of impedance matching using single stub; comparison of open and short circuited stubs

k) Bandwidth consider of a transmission line

LIST OF PRACTICALS

1. To measure the characteristic impedance of a symmetrical T and Pi network .

2. To measure the image impedance of a given asymmetrical T/Pi network

3. For a prototype low pass filter:

   a) Determine the characteristic impedance experimentally

   b) Plot the attenuation characteristics

4. To design and measure the attenuation of a symmetrical T /Pi type attenuator

5. For a prototype high pass filter:

   a) Determine the characteristic impedance experimentally

   b) To plot the attenuation characteristic

   a) To plot the impedance characteristic of a prototype band-pass filter

   b) To plot the attenuation characteristic of a prototype band pass filter

7. a) To plot the impedance characteristic of a m-derived low pass filter

   b) To plot the attenuation characteristics of a m-derived high pass filter

8. To assemble and test the following butterworth <W> fliters

   a) First order low pass and high pass.

   b) Second order low pass and high pass

9. To observe the formation u f standing waves on a transmission line and measurement of SWR and characteristic impedance <W>the line.

10. Draw the attenuation characteristics of a crystal filter.

16. EX 333 ELECTRONIC DEVICES AND CIRCUITS - II

L T P
3 1 3

RAT IONALE

The course provides the students with basic understanding of the principles of common electronic devices and circuits of importance the knowledge regarding the application of various circuits and devices, practical experience in the design, fabrication and testing of circuits

DETAILED CONTENTS

1. Multistage Transistor Amplifier (6 Hr)

Need of mu1tistaq e amp1ifier , different coupling schemes and their working; brief mention of application of each of the types of coupling, working or R-C coupled and transformer coupled multistage ap1ifier, approximate calculation of voltage gain of two stage R-C coupled amplifier and transformer coupled amplifiers and physical significance of the terms bandwidth, upper and lower cross over frequencies. Direct coupled amplifier and its limitation; difference amplifier typical circuit diagram and its working.

2. Transistor Audio Power Amplifiers (6 Hr)

Difference between voltage and power amplifiers; importance of impedance matching in power amplifier, collector efficiency of power amplifier. Typical single ended power of output power; heat dissipation curve and importance of heat sinks; class A, class B and class Camplifiers; collector efficiency and distortion in class A, B and C amplifier (without derivations) working principles of push pull amplifier circuits, its advantages over single <W> power amplifier, cross over distortion in class B operation and its reduction. Different driver stages for push pull amplifier circuit. Working principles of complementary symmetry push pull circuit and its advantage. Transformerless audio power amplifiers and their typical applications.

3. Feedback in Amplifier (6Hr)

Basic Principles and types of feedback

Derivation of expression for the gain of an amplifier employing feedback

Effect of negative feedback on gain, stability, distortion. And bandwidth (only physical<W>

Typica1 feedback circuits;

RC coupled amplifiers with emitter by pass, capacitor removed

Emitter follower and its application, simple mathematical analysis for voltage gain and input impedance of above circuits.

4. Sirusoidal Oscillators
(5 Hr)

App1icattion of oscillators.

Use of positive feedback and negative feedback resistance for generation of oscillation. barkhausen criterion for oscillations.

Different oscillator circuits turned collector Hartley, colpitts', phase shifts, wiens bridge and crystal oscillators and their working principles (no mathematical derivation)

5. Tuned Voltage Amp1ifiers (5 Hr)

Classification of amplifiers on the basis of frequency, Series and parallel resonant circuits, expression for resonant frequency, expression for impedance as, resonance: relationship between resonant frequency, Q and Bano wwidth (no derivation) Hybrid equivalent circuits of translator and its parameters, in h parameters, single and doub1e amplifiers; their working principles and frequency (no mathematical derivation) Concepts of neutralization. Staggered tuned amp1ifier and typical app1lcatons in brief

6. Opto Electronics Devices and Their Applications (5 Hr)

Working principles and characteristics of photo resistors, photo diodes, photo transistors, photo voltaic cells, LEDs LCDs and opto couplers. Simple application of electronic devices (one examp1e of each may be mentioned.

7. Operational Amp1ifier (5 Hr)

Characteristics of ideal operational amplifier and it, block diagram, definition of inverting and non-inverting input, differentia1 voltage gain, input and output volt ages, offset current, input bias current, common mode rejection (CMRR.), Power Supply Rejection Ratio (PSRR) and rate. Method of offset, Null Adjustment, use of Op amp Invertor, Scale changer, Adder, Subtracter, Different integrator.

Schmitt trigger circuit, time base generator circuit <W> S/H switch circuit.

LIST OF PRACTICALS

1. Two stage R.C. Coupled Amplifier

   i) To measure the over all gain of two stages at 1 KHZ and compare it with the gain of Ist stage. Also to observe the loading effect of second stage on the first stage.

   ii) To plot the frequency response curve of two stage amplifier and compare it with that of the single stage amp1ifier.

2. Transistor audio power amplifier

   i) Transistorized single ended power amplofier measurement of optimum load, maximum undistorted power (by giving maximum allowable signal) efficiency and percentage distortion factor.

   ii) Same measurement as above for the transistorized push-pull amplifier

   iii) Same measurement as in (i) for a comp1ementary symmetry amplifier

3. Feedback in Amplifier

   i) Single stage amplifier with and without by pass capacitor measurement of voltage gain and plotting frequency response in both cases (i.e. with and without by pass capacitor)

   ii) Emitter follower circuit measurement of vo1tage <W> and plotting of frequency response curve.

4. Sinusoidal Oscillator

   i) Hartley/Colpittis oscillator circuit measurement of frequency and amplitude, oscillation by plotting the waveshape from CRO

   ii) Wein bridge oscillator circuit - measurement of resonant frequency and amplitude of oscillations by plotting the wave-shape from CRO

5. Tuned Vo1tage Amplifier

   i) Series and parallel resonant <W> - measurement frequency. P1otting of the <W> (i.e. graph between input, frequency and impedance) and calcu1ation of Q of the resonant circuit from this <W>.

   ii) To measure the frequency response, of single tune voltage amplifier and calculate the Q of the tune, circuit 1oad.

6. Use of op-amp (IC 741) is inverting.<W> amplifier, adder, integrator, butter, scale <W>

7. To measure the output off set voltage of an <W> (741) and zero adjustment using nulling techniques.

8. Identification of package types and terminals and familiarization with characteristic and ratings using data book for various optoelectronic devices like photo transistor, photo diode, LED, LDS and Photo Voltaic Cells (any three)

17. EX 334 ELECTRONICS FABRICATION TECHNIQUES

L T P
1 - 6

RATIONALS

The study of electronic manufacturing practices is a detailed study of design and fabrication of PCBs with a view to, assemble desired instruments. The topic of production, testing and documentation have been included to give an overall picture of the process of manufacture of electronic devices and systems. Particularly, the, students should be oriented to practise and draw on the skills acquired in various workshops attended by them earlier.

DETAILED CONTENTS

1. PCB board materials, thein characteristics and limitations (1 Hr)

2. Surface treatment, painting, anodising, p1ating corrosion and its prevention (3 Hr)

3. Photo processing, screen printing, etching, high speed drilling, buffing, surface treatment and protection from harsh environments, plated through holes, double sided and multi-layer PCBs. (4 Hr)

4. Standards of board sizes. Modular assemblies edge connectors, multi board racks, flexible boards. (1 Hr)

5. Assembly of circuits on PCB, soldering techniques, role of tinning, flow and wave soldering. Solderability, composition of solder. Edge connector. Elements of, <W> shaping.

<W>

6. Production: (<W>)

Storage and supply of components for assembly, <W> incoming inspection of components, assembly line reduction, tools and jigs per lead bending. Manual and <W> insertion techniques. Closed loop assembly of modules and/or complete instruments. Specific examples of small scale and large scale production be given to illustrate above mentioned methods

7. Testing: (5 Hr)

Jigs and fixtures for operational testing of modu1es/sub-assemblies. Sequence testing for failure analysis. Environmental testing at elevated temperature and humidity, Vibration and mechanical endurance testing. Packing for transportation

8. Documentation: (5 Hr)

   Statement of brief specifications, detailed specifications and limitations. Block diagram, detailed diagrams. Testing and checking points. Warning relative to high voltage for hand1ing during repair. Fault 1ocation guide. Simple solutions for fault removal

9. Computer aided manufacturing Practices (3 Hr)

10. Production Planning (2 Hr)

11. CNC drilling, photo p1ating (1 Hr)

PRACTICAL WORK

1. Preparation of PCBs (Handmade and screen printed) from schematic diagrams (4-6 examp1es such as single transistor voltage stabilizer, regulated supply, timer etc.)

2. Fabrication of small equipment inc1uding chasing, front pane1 etc (4-6 jobs of increasing <W> involving different techniques of making chassis/cabinets, panel engraving.

1. Waveshaping Circuits

(8 Hr)

General idea about different waveshapes. Review of transient phenomena in R-C and R-L Circuits. R-C and R-L differentiating and integrating circuits. The applications (physical explanation for square/rectangular input waveshapes only). Diode clippers, series and shunt biased type. Double clipper circuits. Zener diode clipper circuits. Use of transistors for clipping. Diode clamping circuit for clamping to negative peak, positive peak or any other level for different input waveforms (e.g. sine, square, tri angular), Ideal transistor switch, exp1anation using C.E. output characteristics.

2. Timer I.C

(2 Hr)

Block diagram of I.C timer (such as 555) and its working. Use of 555 timer as monostable and astable multivibrators.

3. Mu1tivibrator Circuits

(5 Hr)

Concept of multivibrator: astable, monostable, bistable. 555 timer as mono and astab1e mu1tivibrator. Op-amp as monostable, astable multiivibrator and schmitt trigger .

4. Time Base Circuits

(3 Hr)

Need of time base (Sweep) wave forms, special features of time base signals. Simple method of genration of saw tooth wave using charging and discharging of a capacitor. Constant current generation, of linear sweep voltage.' circuit using op-amp.

5. Integrated Electronics

(3 Hr)

Fabrication of transistor by planner process, a typical fabrication process for ICS (brief explanation)

6. Regulated Power Supply

(6 Hr)

Concept of regulation. Principles of series and shunt regulators. Three terminal voltage regulator ICs (positive negative and variable appllications)
Block diagram of a regu1ated power supply. Concepts of cv, cc, and foldback limiting, short circuit and overload <W>
Major specifications of a regulated power supply and their significance (line and load regulation, output nipple <W>) transients)

Basic working principles of a switched mode power supply.
Concept or floating and grounded power supplies and their interconnection to obtain multip1e output supplies Brief idea of CVT, UPS and dual tracking power supply.

7 VCO (IC565) and PLL (IC566) and their applications (<W>)

8 THYRISTORS AND UJT (<W>)

Name, symbol, characteristics and working principles of <W> Triac, diac, SCS, SUS, SBS and LASCR. Mention of applications.
Basic structure, principle of operation and VI characteristics of UJT. Explanation of working of UJT as <W> oscillator and its use in thyristor triggering.

LIST OF EXPERIMENTS

1. Observe and P1ot the Output Waveshape of

   i) R-C differentiating circuits
   ii) R-C integtrating circuits f or squarewave input (observe the effect of the R-C time constant of the circuit <W> the output wave shape for both the circuits

2. i) Construct biased and unbiased series and shunt clipping circuits for positive and negative peak clipping of a sine wave using switch diodes and d.c. sources.

   ii) Construct a double Clipper circuit using diode-and dc. sources and observe waveshapes

   iii) Construct a zener diode and transistor clipper <W> for positive peak, negative peak and double clipping of sine (other wave shapes)

   iv) To clamp sine and square wave to their positive and negative peaks and to a specified level.

3. i) To measure IC and VCE for a translator when to varied from zero to a minimum value and measure the value of 1b(sat), VCE(Sat). <W> for saturation at a given supply voltage and load.

   ii) To calculate the value and assemble and test <W> transistor switching circuits to switch <W>

      a) LED
      b) Relay
      c) 200/500 MA Lamp of 6 or 12 volts

4. To plot input vs output characteristics of Schmitt <W> circuit and plot the input output waveshapes with <W> wave input

5. To test mono and astable multivibrator and to plot waveform

6. To make and test the operations of monostable and astable multivibrator circuits using 555 timer.

7. To determine and plot firing characteristics of SCR by varying anode to cathod voltage, and varying gate current.

8. To note the waveshapes and voltages at various points of a UJT re1axation osci11ator circuit.

9. To plot the firing characteristics of a triac in different nodes, namely, mode I+, mode I–, mode III+, and mode III.

17 EX 432 INTRODUCTION TO MICROPROCESSORS

L T P
3 - 2

RATIONALE

The study of microprocessors in terms of architecture software and interfacing techniques leads to the understanding of working of <W> in a microcomputer. The development in microprocessors of 32 bit architecture bring them face-to-face with mainframe systems. Thus the study of microprocessors relevant in finding of hardware of microprocessors and <W>

Microprocessors find application in process industry. They are also a part of the electronic. They are also a part of the electronic switching system between source and destination in long distance telecommunications. Thus the microprocessors is an area of application. Students of electronics engineering often use microprocessors to introduce programmable control in then projects, in industrial training.

DETAILED CONTENTS

1. Introduction

   a) Typical organization of a microprocessor <W> function of its various blocks.

   b) Microprocessor, its evolution, function and impact <W> modern society.

2. Architecture of a Microprocessor
   (with reference to 8085 microprocessor)

   a) Concept of Bus, Bus organisation of 8085
   b) Functional block diagram of 8085, and function of <W> block
   c) Pin details of 8085 and related signals.
   d) Demeltiplexing of Address/Data bus (AD-AD). <W> of read write control signals.
   e) How is stored program ex executed?

3. Memory organization, and I/O interfacing

   a) Memory organisation, memory map. Partitioning of total space. Address decoding, concept of 10 <W> I/O and memory mapped IO. Interfacing of memory and I/O devices.
   b) Concept of memory mapping.
   c) Concept of stack and its function

4. Programming (with respect to <W> 8085 microprocessors (10 Hr)

   a) Brief idea of machine and assembly <W>. Machine to Mnemonic codes.

b) Instruction format and Addressing mode. Identification of instructions as to which addressing mode to belong.

c) Concept of Instruction set. Explanation of the Instruction of the following groups of instruction set (of 8085):

Data transfer groups, <W>, Logic <W> Stack. I/O and Maching <W>

d) Programming exercises in assembly languages. (Example can be taken from the last of experiments)

5. Instruction Timing and Cycles (4 Hr)

a) Instruction cycle, machine cycle and I states
b) How a stored programme is executes. Fetch and execute cycle.

6. Interrupts (3 Hr)

Concept of interrupt, maskable and <W> unmaskable. <W> triggered and level triggered interrupts. Software in <W>. Restart instruction and its use.
Various hardware interrupt of 8085. Servicing <W> rupts, extending interrupt system.

7. Data transfer techniques (5 Hr)

Concept of programmed I/O operations sync data <W> async data transfer (hand shaking). Interrupt driven <W> transfer, DMA, serial output data, serial input data.

8. Brief idea of interfacing <W>

9. Comparative study of 8 bit microprodessors i.e. <W> 6809

LIST OF PRACTICALS

1. Addition of two 8 bit numbers

2. a) To obtain 2's complement of 3 bit number
   b) To subtract a 8 bit number from another 8 bit <W> using <W> complement

3. Extract fifth bit of a number <W>

4. Count the number of <W>

5. Check even parity and odd parity <W> number

6. Addition of two sixteen bit numbers

7. Subtraction of a sixteen bit number from an other sixteen bit number

8. Multiplication of two 8-bit numbers by repetitive addition

9. Divide two 8- bit numbers by repetitive subtraction

10. a) Smallest number of three numbers
    b) Largest number of three numbers

11. To sort an array of unsigned binary numbers in decreasing increasing order

12. Generate timing delay through software

20. EX 433 ELECTRONIC INSTRUMENTS AND MEASUREMENTS

L T P
3 - 2

RATIONALE

The study of this subject will help a student to gain the knowledge of the working principles and operation of different electronic instruments (Analog as well as digital). The practical work done in this subject will help to acquire <W> in operation and testing of the instruments as per then specifications. Skills in fault diagnosis and repair of instruments will also be imparted.

DETAILED CONTENTS

1. Basic of Measurement (2 Hr)

   Review of performance specifications of instruments accuracy, precision, sensitivity, resolution <W> etc. Errors in measurement and loading effects

2. Miltimeter: (3 Hr)

   a) Principles of measurement of dc voltage and dc current, as voltage, ac current and resistance in a multimeter.

   b) Specifications of a multimeter and their significance.

   c) Limitations with rewards to frequency and <W> impedance.

3. Electronic Voltmeter (3 Hr)

   a) Advantages over conventional multimeter for voltage measurement with respect to input impedance and sensitivity.

   b) Principles of voltages, current and resistance measurements (block diagrams only).

   c) Specifications of an electronic. Voltmeters/Multimeters and their significance.

4. AC Millivoltmeter (3 Hr)

   a) Types of AC millivoltmeters: <W>-rectifier and rectifier-amplifier. Block diagram and explanation of the above types of ac voltmeter

   b) Typical specification and their significance

5. Cathode Ray Oscilloscope (<W>)

a) Construction of CRT, Electron gun <W> focusing and acce1eration (Explanation mathematical treatment) deflection sensitivity, brief mention of screen phosphor for CRT in relation to their visual persistence and chemical composition

b) Explanation of time base operation and need for blanking during flyback; synchronization

c) Block diagram explanation of a basic CRO and a triggered sweep oscilloscope, front panel controls

d) Specifications of a CRO and their significance

e) Use of CRO for the measurement of voltage dc and ac frequency, time period, and phase angles

d Special feature of dual treace, delayed sweep and storage CROs (brief mention only); introduction in digital CROs

e) CRO probes, including current probes.

f) Digital Storage Oscilloscope: Block diagram and principle of working.

6. Signal Generators and Analysis Instruments (4 Hr)

a) Block diagram, explanation and <W>

- laboratory type low frequency and RF signal generators

- pulse generator, and function generator

b) Brief idea for testing, specification for the above instruments

c) Distortion factor meter, wave analysis and spectrum analysis

7. Impedance Bridges and Q-Meters (3Hr)

a) Block diagram explanation of working principle of laboratory type (balancing type) <W> Specifications of a RLC bridge.

b) Block diagram and working principles of a0-meter

8. Digital Instruments: (10 Hr)

b) Working principles of ramp, dual slope and integrating type of digital voltmeter

b) Block diagram and working of a digital multimeter

c) Working principle of time interval, frequency and period measurement using universal, counter/frequency counter, time-base stability, accuracy and resolution.

d) Principles of working and specifications of logic <w>, signature analyser and logic analyser.

e) Digital LCR bridges.

LIST OF PRACTICALS

1. a) To observe the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.

   d) To observe the limitations of a voltmeter for measuring high frequency voltages and currents.

2. To voltage Q of a coil and observe its dependence on frequency, using a Q-meter

3. Measurement of time period, frequency, average period, and phase single using CRO

4. Measurement of time period, frequency, average period using universal counter/ frequency counter.

5. Measurement of rise, fall and delay time using a CRO

6. Measurement of distortion of a LF signal generator using distortion factor meter

7.
8. Measurement of R,L and C using a LCR bridge/ universal bridge

21. Ex 435 ELECTRONIC DRAWING AND DESIGN

L T P
- - 4

RATIONAL

The purpose of this subject is to give practice to the student in drawing of symbols as per ISI standard. Elementary design and drawing of semiconductor devices, various components, circuits of a small power transformer, design of "square wave Generator and circuitory for using a dc micro-ammeter.

DETAILED CONTENTS

1. Draw the standard symbols of following (15 Hr)

(Different parts of ISI Standard 15.2032 may be referred to to) electronics and Electronic for Electronics withs sped to Digita1 EC and UP system design.

Components Resistors - Fixed, tapped and variable (presets and potentiometers LDR, VDR and Thermistors, Capactors Capactors Fixed, tapped and variable types RF and AF chokes and inductors air cored, solid cored and laminated cored, Transformer-step up, step down, AF and RF types, Auto transformer, IF transformer, three phase Antenna, chasis, Earth, 1oud speaker, Microphone, ear-phone, Fuse, indicating lamp, co-axial cables. switches-doub1e po1e-on/off dou.b1e pole, double throw and rotary types, terminal and connections of conductors.

Devices: Semiconductor-Rectifier diode, tunne1 diode, zener diode varactor diode, tunnel diode, photo diode, light emeting diode (LED), Bipo1ar transistor field effect transistor (FET), MOSFET Photo transistor, Uni junction transistor (UJT) silicon contro1 Rectifier, Diac and Triac. Case cut-lines (with their type numbers) of different types of semiconductor-diodes, transistors, SCR, diacs, triacs and ICS (A1ong with indicators for identifying pin etc)

2. Draw the Following: (15 Hr)

Circuit diagram of typical mu1timeter, Circuit diagram of a typica1 e1ectronic mu1timeter. Circuit diagram of typical transistor radio receiver. Complete block diagram of typical monochrome TV transmitter and receiver system. Front panel details of typical CRO.

5. Design and Draw for the given Specifications the following

(15 Hr)

A sma11 power transformer. A simple power supply using full <W> rectifier and different types of fliters. Simple zener regulated power supply <W> (single stage low-frequency amplifier (given specifications <W> being the input impedance, load <W> input signal level and the frequency <W>

Square-wave generator using 555 <W> Using <W> Wein's Bridge type using an <W>. Voltage controller <W> oscillator using IC565.

Circuitory for using a DC micro-ammeter as

(i) a voltmeter
(ii) a current meter
(iii) an ohm meter

for specified ranges

22 Ex 433 MINOR PROJECT WORK

<W>

Minor project work aims at exposing the student to the various industries dealing with e1ectronics components, <W> circuitory and micro processors. They are expected to 1earn <W> the construction, working principles of different electronic and Micro processors based instruments. It is expected from them get accqunitated with industrial environment at the snoc <W> and acquire desired attitudes. For this purpose student <W> middle of course are required to be sent for a designated period in different industries where production/servicing/installation of microprocessor based systems is going on. Depending on an interest of students they are sent to :

1. Communication stations.
2. Various micro processor oriented industries.
3. Te1ephone/Telegraph stations.
4. Micro processor based control system industries.
5. Medical e1ectronics industries.
6. Repair and maintenance work shops.

As a minor project activity each student as supposes to study the operations at sight and prepare a detail project report of the observations/processes/activities by him/her. These students should be guided by respective subject teachers <W> teacher may guide a group of 4 to 5 students.

The teachers along with field supervisor/engineers conduct performance assessment of students.

	Criteria	Weightage
a)	Attendence and Punctua1ity.	15%
b)	Initiative in performing tasks/clearing new things	15%
c)	Relation with people	15%
d)	Report writing & seminar	55%

<W>3. CM.403 INDUSTRIAL MANAGEMENT AND <W>

<W>

RATIONAL

The knowledge of this subject is required <W> engineering technicians, but it becomes more important more important for <W> who intend to choose industry for their career. This <W> designed to develop an understanding of various<W> managements, role of worker, foreman and engineer <W> safety, marketing, entrepreneurship, <W> industrial legislation.

DETAILED CONTENTS

1. Introduction (<W>)

Pattern of economics i.e. <W> economy and mixed economy. Industrial <W>

2. Business Organisations (<W>)

Salient features of sale proorietary. <W> and public limited companies <W> public sector.

Role of public and private sectors in growth <W> their social obligations towards society<W> and price restriction.

3. Entrepreneurship (<W>)

Entrepreneurial qualities, selection of product, <W> of capital expenditure resources of capital <W> agencies, procedural formalities for <W>. Exposure to sales tax registration <W> and project report preparation.

4. Financial Management (<W>)

Brief idea of money banking, international trade foreign exchange, various taxes such as property, wealth company income, excise duty, sales tax, finance forecasting. Types of accounts and account books, trial <W>and statements.

5. Personnel Management (<W>)

Duties and responsibility of <W> manpower planning, sources of <W> selection, various methods of <W> development of workers and <W> retrenchment. Industrial relations discipline

Industrial fatigue, leadership, attitudes and human Behaviour, morale maintenance, motivation systems, payment of Wages, personnel records.

6. Technician (3 Hr)

Role of engineer and technical of the industry and in society duties and responsibilities of a technician (foreman) towards management, workers and work.

7. Industrial Safety and House Keeping (7 Hr)

Magnitude and cost of accidents, causes of accident, job safety analysis, safety planning and its implementation safety education instruction and visual aids, obligatory provisions, first aid, investigation of accident, fire Fighting, BIS standards, security watch and ward.

8. Marketing (6 Hr)

Importance of marketing, theory of demand and supply forecasting demand and supply, product pricing, branding and packing, sales promotions, advertising and publicity, warranty, after sales service, product improvement and development, salesmanship, tenders and contracts installation and commissioning, feedback invoicing and trade documents.

9. Industrial Legislation (6 Hr)

Important provisions of the following acts: Factory Acts ESI, GPJ, Bonus, Trade Union, Industrial Dispute, Shop Minimum Wages, Compensation, Apprenticeship, Payment of Wages Acts and Commercial Establishment Act.

24. EX 530 PC ORGANIZATION

L T P
2 - 2

DETAILED CONTENTS

1. Hardware Organization of PC (5 Hr)

Microcomputer organization, <w> architecture, instruction set, memory address & addressing Techniques and I/O addressing. The motherboard of the PCs memory organization, system timers/counters, interrupts vectoring, Interrupt controller, DMA controller & its channels, PC-bus slots, various types of digital buses, Serial I/O ports e.g COM1 & COM2, parallel port.

2. The Video Display Of The PC (3 Hr)

The basic principles of the working of a Video monitors, video Display adapters (monochrome & colour graphic), Video modes.

3. The Keyboard of the PC: (3 Hr)

The basic principles of the working of a PC Keyboard, <w> codes.

4. Disk Drives: (4 Hr)

Constructional features of Hard disk and, Floppy disk and <w> Drives(HDD and FDD).

Logical structure of a disk and its organizations <w>, Record, File Allocation Table (FAT), Disk Directory , <w>, Space.

5. Peripheral Devices: (4 Hr)

Basic features of various other peripheral devices <w>, Mouse, printers (DMP, Inkjet, laser), scanner, <w>, Digitizer and Modem.

6. Power Supplies: (4 Hr)

SMPS used in PC and its various voltages. Basic idea <w> Constant voltage transformer (CVT) and un-interrupted <w> supply (UPS) – offline and On-line.

7 The BIOS and DOS Services (5 Hr)

The basic idea of BIOS and DOS Services for <w>, Serial Port, Keyboard, Printer and Misc Services.

8. Advanced Microprocessor (4 Hr)

Basic features of 32 bit Intel micorporessor 80386, 80486 and Pentium,

LIST OF EXPERIMENTS:

1. To identify various'- components, devices and section of PC.

2. To interconnect the system unit with the video monitor mouse and keyboard, and test the operation of PC.

3. To connect various add-on cards-and I/O devices to a PC motherboard, and test their working.

4. To note the voltages and waveforms at various terminals in the I/O channel (Bus Slots).

5. To study the SMPS circuit of a PC, measure various supply voltages, and connect it to the motherboard other appropriate I/0 device.

6. To study the operation of a CVT used to supply power to a PC.

7. To study the operation of an uninterrupted power supp (UFS).

Reference Books:

1. Bose, SK, "Hardware St Software of Personal Computers", Wiley Eastern Limited, New Delhi.

2. Hall, Douglas, "Microprocessors and Interfacing". McGraw Hill.

3. Uffenbeck.

25 EX 5 31 COMMUNICATION SYSTEMS

L T P
3 - 2

DETAILED CONTENTS

1. AF/FM -Transmitters (4Hr)

   a) Classification of transmitters on the basis of power frequency

   b) Concept of 1ow level and high level modu1ation. Block diagram of low and high level modulated AM transmitters and working of each stage

   c) Block diagram and working principles of <w> transistor and armstrong FM transmitters.

2. AM/FM Radio Receivers

   (9 Hr)

   a) Principle of working with block diagram of superheterodyne of AM reciever. Function of each block and typical waveforms at input and output of each block.

   b) Performance characteristics of <w>radio receiver sensitivity, selectivity, fidelity, S/N ratio, <w> rejection ratio and their measurement procedure, ISI standards on radio receivers <w>.

   c) Selection criteria for intermediate frequency, Concepts of simp1e and de1ayed AGC.

   d) Block diagram of an. FM receiver, function of <w> and waveforms at input and output of different <w>. block Need for limiting and de-emphasis in reception.

   e) Block diagram of communication receivers difference with respect to broadcast receivers.

3. Antennas: (11<w>)

   a) Electromagnetic spectrum and its various ranges: <W> LF, HF, VHF, UHF, Microwave.

   b) Physical concept of radiation of electromagnetic <w> from a dipole. Concept or <w> <w> <w>.

   c) Definition and physical concepts on <w> <w><w> used <w> <w> antennas like point source, gain directivity <w> <w> <w> effective area, radiation pattern, <w> <w> <w> width and radiation resistance.

d) Types of antennas brief description , characteristic and typical application of half wave dipole, <w> wave <w> antenna, folded dipole, <w> <w> , <w> antennas, <w> and ferrite <w> <w> <w> <w> transistor receiver.

e) Brief description of broad-side and end fire arrays. their radiation pattern and applications (without analysis); brief idea about Rhombic antenna and oisc antenna

4. Propagation: (10 Hr)

Basic idea about different modes of radio wave propagation and typical areas of applications.

Ground wave propagation & its characteristics, summer field equation for field strength.

Space wave communication - line or sight propagation, standard atmosphere, concept of effective earth radius range of spacewave propagation in standard atmosphere.

Duct propagation: sky wave propagation – iomosphere & <W> layers. Explanation of terms - virtual height, <w> frequency, skipdistance, maximum usable frequency, multiple hop propagation.

5. Fiber Optics Communication: (<W>)

Advantages of Fibre optic communication

Construction features of optical fibre and fibre optics cable, 'Concepts of numerical operator (NA). Modes of propagation in an optical fibre and characteristics of single mode and multimode fibres. Fibre attenuation and dispersion.

Light sources – Diode laser, LEDs and their characteristic.

Light dictators and their characteristics.

Basic idea of fibre connection techniques.

Block diagram of a fibre-optic communication link

6. Satellite Communication:

Basic idea, passive and active satellite, Meaning of the terms; orbit, apogee, perigee.

Geostationary satellites and its need. Block diagram and explanation of a satellite <w>

LIST OF PRACT ICALS

1. To plot the sensitivity characteristics of a radio receive and determination of the frequency for maximum sensitivity

2. To plot the selectivity characteristics of a ratio receiver

3. To plot the fidelity characteristics of a radio receiver

4. To alion AM broadcast radio receiver

5. To plot the radiation pattern of adirectional and <W> directional antenna

6. To plot the variation of field strength of a radiated wave, with distance from a transmitting antenna.

7. Fami1iarisation and identification of fibre optic components such as fibre optic light source, detector, connector assembly etc.

8. To assemble the fibre optic communication set up (using teaching module) and compare the transmitted signal with the output of the receiver.

9. To measure the light attenuation of the optic fibres

NOTE: Visits to appropriate sites of digital/data communication networks, satellite communication, telemetry centres (like remote sensing) and fibre optic communication installation should be made with a view to understand their working, comprehensive report must be prepared by all students o these -visits, especially indicating the dates and location of their visits

26. EX 532 CONSUMER ELECTRONICS

<W>

RATIONALE

To introduce the students with working principles, block diagram, main .features of consumer electronics device audiosystems CD systems, TV, VCR and other items like clocks calculators micro wave ovens photostat machines, in order to develop in him capabilities and interest of fault diagrams, and rectification

DETAILED CONTENTS

1. Audio Systems (12 Hr)

Microphones: Construction, working, principles <W> applications of microphone : carbon , moving coil, velocity crystal condensor type. Cordless microphone.

Loud Speakers: Direct radiating, horn loaded <W> tweeter , mid range, multi-speaker system baffles and<W> enclosures

Sound Recording: on magenetic tape, its principles, block diagram and tape transport mechanism

Digital sound recording on tape and disc

CD Systems

Hi-Fi systems, pre-amplifiers, amplifiers, and Equa1isers. Stereo Amplifiers.

2. TV (12 Hr)

Principles of Black and White and colour TV communication scanning, composite video signal, block diagram of <w> PAL TV receiver, B/W & colour, TV picture tube, <W>

3. VCR (8 Hr)

Principles of video recording on a magnetic tape, block diagram of VCR, VHS tape, transport mechanism

4. Basic Block Diagram, working principles and specification of the following;

- Digital watch/clock
- Calculator
- Washing machine
- Microwave ovens

- Cord1ess te1ephones
- Pager
- Electrostat machine
- Electronic ignition system for automobiles

LIST OF PRACTICALS

1. To plot the frequency response of a microphone.

2. To plot the frequency response of a loudspeaker.

3. To study a typical tape transport mechanism.

4. Troub1eshooting of a typica1 tape recorder system.

5. To study the working of digital watch/ clock and ca1culator.

6. To study the working of automatic washing machine and microwave oven.

7. To study the working of cordless telephone and pager.

8. To study the working of Photostat machine.

9. To observe the waveforms and voltages in a B/W and PAL TV receiver.

10. To study the working of a VCR.

27. EX 536 TROUBLE-SHOOTING AND MAINTENANCE OF ELECTRONIC EQUIPMENT

L T P
2 - 4

RATIONALE

The course provides the students with necessary knowledge and competency to diagnose the faults for trouble shooting and for systematic repair- and maintenance of electronic equipment and components.

DETAILED CONTENTS

1. Repair, Servicing and Maintenance Concepts (2 Hr)

Introduction, Modern electronic equipment, Mean time between failures (MTBF), Mean time to repair (MTR), Maintenance policy, potential problems, preventive maintenance, corrective maintenance.

a) Study of basic procedure of service and maintenance

b) Circuit tracing techniques

c) Concepts of shielding, grounding and power supply considerations in instruments.

2. Fundamental Trouble Shooting Procedures (4 Hr)

Fault location

Fault finding aids

- Service manuals
- Test and measuring instruments
- Special tools

Trouble Shooting Techniques

- Functional Areas Approach
- Split half method
- Divergent, convergent and feedback oath circuits analysis
- Measurement techniques

3. Passive components (6 Hr)

Test procedures for checking passive components, resistors, capacitors, inductors, chokes and transformers.

4. Semiconductor Devices (From Test inn Procedure Point<W>

Dicoes rectifier and zener diodes <W> transistors. Field effecr transistors JFET and FET Thyirstors.

unijuction transistors, Photo cells, Transistor equivalents. Data Books on transistors.

5. Trouble-shooting Digital Systems (4 Hr)

Typical faults in digital circuits. Use of Logic clip, logic probe, logic pulser, IC tester.

6. Typical Examples of Trouble Shooting (8 Hr)

Trouble shooting procedures for the following:

- Oscilloscope
- Power supplies
- Digital multimeters
- Signal generator
- PA system
- Tape reorder and
- Stereo amplifier

7. Log Book & History Sheet (2 Hr)

Introduction, preparation and significance of log book and History sheet.

LIST OF EXPERIMENTS

1. Selection, demonstration and correct use of tools and accessories, tools pliers', wire cutter, wire stripper, tweezers, soldering iron, desoldering tools, neon tester, screw driver

   Accessories insulating tapes, solders, solder tips, flux, <W> deso1dering wick , so1der c1eaning fluids , s1eeves , tags , identifiers

2. Develop skill in assembly of components, wiring, soldering and deso1dering methods

3. Selection and use of commonly used passive components and accessory

4. Testing of active and passive components.

5. Testing of 1inear integrated circuits

6. Use of .digital tools for troubleshooting digital components

7. Trouble, shooting at least two of the following equipments:

   Oscilloscope , Power supplies, electronic multimeter , signal generator, PA system, Tape recorder and Stereo amplifier

28. EX 537 PRODUCT DESIGN AND DEVELOPMENT

L T P
- - 6

RATIONALE

The subject provides the students the .knowledge and background training for circuits tracing from a prototype instrument drawing of schematic diagram and ultimately design and development PCB circuits and: instruments both directary and with ‘the use of auto-CAD.

DETAILED CONTENTS

1. Principles of circuit tracing from a prototype instrument, preparation of schematic diagram (4 Hr)

2.Layout considerations of electronic circuit for PCB; considerations of heat sinking and large current/high voltage. PCB drawing techniques, standard conventions, inked art work, taped art work, role of scaling, tolerance in drawings. Universal boards. (8 Hr)

3. Assembly of instruments. Different considerations in design of chassis, cabinets, racks, standard designs and sizes. Hardware partitioning, Special considrations: Human factors accessibility of controls, ease of operation. Economy of panel design, colour, size of lettering, size of knobs etc. (8 Hr)

4. Computer aided drafting for mechanical chasis using CAD. (20 Hr)

5. PCB design using Smartwork/Prote1/.Eag1e/Orcad/Pcad, or equivalent packages. (15 Hr)

6. PCB fabrication. (15 Hr)

29 EX 528 INDUSTRIAL ELECTRONICS AND INSTRUMENTATION

L T P
3 - 2

RATIONALE

Electronic adapted to industrials plant, in terms of timings, action switching and action or parameter control, its called 'Industrial Electronic'; other common areas of application where electronics is increasing its interface with other branching of engineering include temperature control, welding control, speed regulation of motor and soldering. The student should study this subject with the view to understand the use of electronics to bring about faster and more accurate response in industrial plants.

DETAILED CONTENTS

1. Thyristor ratings arid gate ratings. Turn on methods - DC gate , AC Gate, and Pluse Gate Triggering and R-C trigger circuits, Turn off method – Natural and Forced turn off method.

2. International power dissipation and need for Heat Sinks in thyp<W>. istors. Definition of following terms and their relations with the power dissipation of the device (no deviation).

   a) Heat Sink efficiency

   b) Heat Sink transfer co-efficient.

   c) Heat dissipating area of a Heat Sink, Concept of thermal resistance of Heat Sinks. Various Types of Heat sinks and techniques of mounting device on Heat sinks.

3. Principle of operation and working of the following switching circuits, using SCRs and Triacs.

   a) Automatic Battery Charger.
   b) Voltage regulator.
   c) Emergency light.
   d) Alarm circuit.
   e) Time delay relay Circuits
   f) Circuits for over voltage and over current. (5 Hr)

4. a) Explanation of the working of a 3 phase half wave and full wave bridge rectifier with the help of waveforms.

b) Explanation of working of following <w> rectifier using SCRS and resistive and inductive loads with the help of wave forms and appropriate mathematical expression (no deviation).

- Single phase; half wave, full wave and bridge rectifier.
- Three phase; Half wave, full wave and bridge rectifier. (5Hr)

5. Principle of working of AC phase control circuit using triac and its application.

6. Application of phase controlled rectifications and AC phase control circuits in: (3Hr)

a) Illumination control
b) Fan speed control
c) Temperature control
d) Speed control of DC and small AC motors

7. Principle of operation of Basic inverter circuits. Basic series and parallel commutated inverters. (3 Hr)

8. Principle of induction and dielectric heating and then typical application. (3Hr)

9. Introduction to instrumentation: (3 Hr)

Basic Measurement System function its elements namely the transducer, signal conditioner, display or read-out and power supply.

10. Transducers : (6 Hr)

a) Distinction between active and passive transducers with examples, Basic requirements of a transducer.

b) Principle of operation or the following transducers and their application in measuring the physical quantities listed against each one of them.

c) <u>Transducer</u> <u>Physical quantities</u>

<u>Variable Resistance Type</u>

- Potentiometeric Resistance device — Displacement and force
- Strain gauge — Torque and displacement
- Thermistor — Temperature
- Resistance Hydrometer — Humidity

d) <u>Variable capacitance Type</u>

- Variable capacitance — <W> and pressure
- Pressure gauge
- Dielectric guage — <w> <w> <w>

d). Variable Inductance Type

- LVDT	Pressure, force, displacement and position

f). Other Types

- Solid State Sensor	Temperature
- Thermocouple	Temperature
- Piezoelectric device	Force
- Photoelectric devices	Light
- proximity probes	r.p.m
- Digital transducer	displacement

11. Signal Conditioners (3Hr)

Characteristics of instrumentation amplifiers in respect of input impedance, output impedance, drift, dc offset, noise, gain, common mode rejection ratio, frequency response, relating to suitability of these characteristics for amplifying signals from various transducers. Need and working of a typical isolation amplifier

12. Output Devices and Displays (3 Hr)

Basic principles of operation, constructional features and application of the fo1lowing:

a) Graphic Recorder
b) X-Y Recorder

LIST OF PRACTICALS

1. Observation of waveshape and measurement of voltage relevant points of an SCR based single" phase half wave controlled rectifier circuit using resistive (in phase gate triggering circuit).

2. Observation of. waveshapes and measurement of voltages at relevant points of an SCR. based single phase half wave controlled rectifier circuit using R-C phase shift gate triggering circuit.

3. Observation of waveshapes and measurement of voltages at relevant, points of an SCRs based single phase half wave controlled rectifier circuit using UJT relaxation oscillator for gate triggering.

4. Observation of waveshapes and measurement of voltage relevant points of an SCR based single phase full wave controlled rectifier circuit

5. Observation of waveshapes and measurement of voltages at relevant points of an SCR based single phase controlled bridge rectifier circuit.

6. Observation of waveshapes and measurement of voltage at relevant points in a triac based AC phase control circuit used for lamp intensity and/or AC fan speed control

7. Observe the waveforms and measure voltages at various points of a circuit for over voltage protection using SCR

8. Study of various transducers like Strain gauge, thermistor, photdiode, phototransistor, etc.

9. To assemble & test an instrumentation amplifier, measure its gain, input and output impedance.

10. Study an X-Y recorder and graphic recorder.

30. Ex 630 **TV ENGINEERING**

L T P
3 - 2

RATIONALE

The objective of teaching this subject to the student is to give him an indepth knowledge of various aspects of black & white & colour TV. This is to knowledge in him capability to assemble TV's and also to systematically, diagram its faults and rectify the same.

DETAILED CONTENTS

1. (a) Monochrome TV Communication: (8 Hr)

- Elements of TV Communication system.
- Scanning, its need for picture transmission.
- Need for synchronizing and blanking pulses.
- Progressive scanning; interlaced scanning; its needs persistence of vision. Frame, field and line frequencies bandwidth requirement for picture transmission. Concept of picture resolution and its dependence on bandwidth.
- Composite video signal (CVS), Blacker than-black level CVS at the end of even and odd fields. Equalising pulse and their need.
- Construction and working of monochrome picture tube. Comaprison of magnetic and electric deflection of beam.
- Construction and working of vidicon, and plumbicon camera tubes. Typical voltages at diffirent electodes. Block diagram of TV camera and the transmitter chain.
- Block diagram of a TV receiver, function of each block and waveforms at the input and output of each block.
- Frequency range of various VHF bands and channels used in India. Major specifications of the C CIR.

(b) System adopted in India. Channel bandwidth and transmitted RF spectrum (8 Hr)

- Concepts of positive and negative modulation. VSB transmission, trap frequencies and aspect ratio.
- Typical circuits of scanning and EHT stages of TV receiver and explanation of their working principles. Function of keyed AGC.

- Function and location of brightness cantrast V- hold. H-hold of centring control.

- Identification of faulty stage by analysing the symptom: and basic idea of a few Important faults and their remedies.

2. Colour TV Communication: (10 Hr).

- Relative sensitivty of eye to différent spectral colurs (visibility curve).

- Primary colours', tristimulus" values; trichromatic coefficients.Concept of additive and subtracting mixing of colours. Concepts of luminance, Hue and saturation. Representation of a co1our in co1cour triangle. Non-spectral colours.

- Compatibility of colour TV system with the monochrome TV system. B1oc*k* diagram of colour TV camera. Basic colour TV systems-NTSC, SECAM, and PAL; their advantage and disadvantages.

- Construction and working principles,of trinitron and PIL types of co1our picture tubes.Concepts of convergence, purity,blue-beam shifting.

- Need for luminance signal and band-sharing by colour signa1s. Sub-carrier freguency. Colour-difference signal, its need. Synchrononou quadratic modulation end representation of a colour by a vector. Burst signal, its need. Chrominance signals.

- Block diagram of PAL TV receiver and explanation of its working.

3. Cable TV : (6 Hr)
   - Principles of working with block diagram function of each of the component unit.

LIST OF PRACTICALS

1. To identify the receiver components, and locate different stages on the chassis of a Black & White TV receiver

2. To identify, of receiver components, and locate different stages on the chassis of a PAL colour TV receiver.

3. To operate various controls and adjustments on a TV receiver and observe their effect (contrast Brightness, volume, tone, fine tune, hold, height, width, H and V linearity, AGC, raster centering and Pin – cushion correction etc)

4. To operate various controls and adjustment on a PAL TV receive and observe their effect (colour control, AFT, ACC, qrey sacalle tracking).

5. To note DC voltages and the wave forms at various points in a D/W TV receiver

6. To note DC voltages and the wave forms at various points in a PAL colour TV receiver.

7. a) To observe the effect of brightness control on the grid-to-cathode bias of the CRT and note the cut off bias for CRT

   b) To observe the effect of contrast control on the luminance signal at the cathode of the CRT

8. To use a colour pattern genretor and subjectively evaluate the raster reproduction

9. To install and study satellite TV receiver system including dish antenna and the receiver.

10. To study typical faults in different section of B/W To receiver.

11. To study typical faults in different section of a PAL TV receiver.

31. EX 631 ADVANCED COMMUNICATION SYSTEM

L T P
3 - 2

DETAILED CONTENS

1. Introduction of Basic block diagram of digital and data communication systems. Their comparison with analog communication system. (2 Hr)

2. Coding (5 Hr)

   a) Introduction to various common codes 5 bit baudot codes 7 bit ASCII, ARQ, EBCDIC

   b) Code error detection and correction techniques Redundancy, parity, (block check character <w> Vertical Redundancy check (VRC), Longitudinal Redundancy check (LRC), cyclic Redundancy check (CRC) Hamming code.

3. Digital Modulation Techniques: (4 Hr)

   a) Basic block diagram and principal of working of the following:

   - Amplitude shift keying (ASK): Interrupted continuous wave (ICW), two type tone modulation.

     Frequency shift keying (FSK)

   - Phase shift keying (PSK)

4. Characteristics/working of data transmission circuits: bandwidth requirements, data transmission needs, noise, cross talk, echo suppressers, distortion, equalizers (3 Hr)

5. UART, USTART: (1 Hr)

   Their need and function in communication system

6. Modems: (2 Hr)

   Need and function of modems, Mode of modems operation (low speed, medium speed and high speed modems).Modem interconnection, modem data transmission speed, Modem modulation method, Modem interfacing (RS 232 interface other interfaces).

7. Network and Control Consideration: (6 Hr)

   Protocols and their functions.

Data communication network organization, Basic idea of various modes of digital switching – circuit switching, massage switching, packet switching.

Basic concept of Integrated services

Digital, Network (ISDN) its need in modern communication, brief idea of ISDN interfaces

Basic idea of local area Network (LAN), and its various topologies

8. Telemetry: radio-telemetry, and its application Block diagram of TDM and FDM telemetry system (1 Hr)

9. Radio-paging systems: concept and application. (1 Hr)

10. Electronic Exchange: Typical telephone network various switching offices (Regional Centre, District Centre. District centre, Local Office) and their hierarchy. (6 Hr)

Principal of space division switches. Basic block diagram of a digital exchange and its working.

Combined space and time switching: working principal <w> and TST switches.

Function of the control system of an automatic exchange stored programme control (SPC) processor and its application in electronic exchange and rural telephone exchange.

Introduction to PBX, PABX and EPABX .Function of PBX. PABX relation with central office. Modern PABX capabilities.

11. Operation of CELLULAR mobile telephone system. Concept of cells and frequency reuse. Special features of cellular mobile telephone. (2 Hr)

12. Facsimile (FAX) (2 Hr)

Basic idea of FAX system and its application. Principal of operation and block diagram of modern FAX system. Important features of modern FAX machines.

13. Carrier Telephony (4 Hr)

Features of carrier telephone system; hybrid coils, Frequency allocation and formation of group, schemestic diagram and working of 3-channel and 12 channel carrier system. Carrier and pilot frequency generation

LIST OF PRACTICALS:

1. Transmission of Hamming code on a serial link and its reconversion at the receiving end.

2. Observe wave forms at input and output of ASK and FSK modulators.

3. To transmit parallel data on a serial link using USART

4. Transmission of data using MODEM.

5. Observe wave forms at input and output of a TDM circuit

6. To study the construction and working of a telephone handset.

7. To study the construction and working of a FAX machine.

8. To study the construction and working of an EPABX.

9. To study the working of a cellular mobile system and pagers.

10. To study the working of a LAN system.

NOTE: Visits to the sites of all types of telephone exchange (including mobile and rural exchanges, FAX and Carrier telephony should be made with a view to understand their working. A comprehensive report must be prepared by all the students on these visits, especially indicating, the dares and locations of their visits.

31,32 ELECTIVE I AND II

ELECTIVE EX 632 MICROWAVE ENGINEERING

L T P
3 - 2

RATIONALE

This subject is the part of the wireless communications <w> Includes an exposure to microwaves engineering, radar systems and also radio navigation. In microwaves industry job opportunities are of assembly production, installation, repair and maintenance of microwave transmitters and receivers. The knowledge of radar systems and radio navigation allows opportunities with civil and defense organizations dealing with aircraft and shipping.

DETAILED CONTENTS

1. Introduction to Microwaves: (1 Hr)

Introduction to microwaves and its application. Classification on the basis of its frequency bands (HF, VHF, UHF, <W>, S, C, X, ku, k, ka, mm, sub mm)

2. Microwave Devices: (10 Hr)

Basic concept of thermionic emission and vacuum tubes. Effects of inter-electrode capacitance, Lead inductance and Transit time on the high frequency performance of conventional vacuum tubes, and steps to extend their high frequency operations.

Constructional, characteristics, operating principles and typical application of the following devices : (No mathematical treatment)

- Multi cavity klyatron.
- Reflex klystron
- Multicavity magnertron
- Travelling wave tube
- Gun diode and
- Impatt diode

3. Waveguides: (6 Hr)

Rectangular and circular waveguides and their application. Modes of waveguide. Propogation constant of a rectangular waveguide, cut off wavelength, guide wavelength and their relationship with free space wavelength (no mathematical derivation). Impossibility of TEM mode in a waveguide. Field configuration of TE, TE and TM mode

4. Microwave Components: (6 Hr)

   Constructional features, characteristics and application of: tees, bends, matched termination, twists, detector mount, slotted section, directional coupler, fixed and variable attenuator, isolator, circulator and duplexer; coaxial to wave guide adapter

5. Microwave antennas: (3 Hr)

   Structure characteristics and typical application of Horn and dish antennas

6. Microwave Communication Systems: (5 Hr)

   a) Block diagram and working principles of microwave communication link

   b) Troposcatter communication: Troposphere and its properties, Tropospheric duct formation and propagation, troposcatter propagation. Block diagram of Tropospheric communication link. Diversity phenomenon. Advantages, disadvantages and application of troposcatter communication.

7. Radar Systems: (6 Hr)

   a) Introduction to Radar, its various applications. Radar range equator (no derivation) and its application.
   b) Block diagram and operating principles of basic pulse radar, concepts of ambiguous range, radar area of cross-section, and its dependence on frequency.
   c) Block diagram and operating principles of CW (Doppler) And FMCW: radars, and their application.
   d) Block diagram and operating principles of MTI radar.
   e) Radar display – PPI

LIST OF PRACTICALS

1. To measure electronics and mechanical tuning range of a reflex klystron

2. To measure VSWR of a given load

3. To measure input impedance of a horn

4. To measure the klystron frequency by slotted section method

5. To measure the directivity and coupling of a directional coupler

6. To plot radiation pattern of a horn antenna in horizontal and vertical planes

7. To verify the properties of magic: tee

ELECTIVE EX 633 DIGITAL SYSTEM DESIGN

L T P
3 - 2

DETAILED CONTENTS

1. Combinational Circuit : (15 Hr)

   Review of logic variables; Boolean expressions, Minimization of Boolean expressions using map method; Tabular method of function minimization, Optimal realization of Boolean expression using gates (SSI approach), Multiplexer/Decoder (MSI approach), ROM/PLA (LSI approach).

2. Sequential Circuits: (25 Hr)

   Essential components of a sequential circuit, synchronous and asynchronous sequential circuits. Classification of sequential circuits (Mealy & Moore Machine).

   Flip-flop as memory element: RS, D, JK (including master slave), T, their excitation and characteristic (Truth tables), conversion of JK to D and T. Generation of primitive state table/diagram, its minimization of states, state assignment, choice of memory element. Design of next state decoder, output decoder (SSI, MSI approach).Worked examples for sequential system design, synchronisation of asynchronous inputs, spikes in output and their removal. Design approach to asynchronous circuits, definitions of cycles races and hazards.

LIST OF PRACTICALS

1. Design and implement a code converter for Binary-to-Gray code conversion using decoder.

2. Design and implement full adder and full subtractor using multiplexer.

3. Program an EPROM using EPROM programmer.

4. Using PROM/PLA design and implement a combinational circuit.

5. Design and implement a Madulo-5 synchronous counter using JK Flip-flops.

6. From a given problem statement, design and test a typical sequential circuit.

7. Design a 4-bit sequence generator.

ELECTIVE EX 634 MICROPROCESSOR SYSTEM DESIGN

L T P
3 – 2

DETAILED CONTENT

1. Block diagram of Microprocessor based system. Bus structure .Selection criteria of Microprocessor for different applications. (3Hr)

2. Review of Microprocessors: 8085 and 8086/8088, their architecture, programming models, addressing modes and instruction set. (4 Hr)

3. Memory Interfacing: Characteristics, Timing consideration & Address decoding. Interfacing of static and dynamic RAMs. Interfacing of ROMs. (4 Hr)

4. I/O Interfacing: Interfacing of keyboards, displays, ADC and DAC (4 Hr)

5. Perpheral Interfacing Chips: Block diagram operation, programming and interfacing considerations of the following chips: 8255, 8253, 8251, 8259A, 8229 and 8237 (4 Hr)

6. System Design Consideration: steps for design of Microprocessor based system. System specifications and design constraints, various design alternatives, Noise filtering & signal conditioning, Cost effectiveness, system flow diagram & block diagram. Protioning of hardware & software and their trade offs. (4 Hr)

   Working out the major devices & components and software routines. Construction and testing of prototype hardware. Debugging of the software integration of hardware and software. Analysis of system performance in real time systems.

7. Development Tools: Software Tools and Method, Emulator, Simulator, Assembler, Debugger , MDS. (4 Hr)

8. Interfacing Standards: RS232, IEEE488, Current loop, S100. (3 Hr)

9. Microprocessor Troubleshooting: Typical faults, instruments for fault finding: Logic Pulser, Logic probe, Logic analyzer, Signature analyzer. (6 Hr)

10. Design example and Case Students for example, multichannel DOS, temperature monitoring and control system. CNC machine control (3 Hr)

LIST OF PRACTICALS

1. Practice on use of software tools: assembler and debugger.

2. Practice on working of hardware development tools: Emulation, MDS.

3. Interfacing of a multichannel A to D converter.

4. Interfacing of Stepper motor.

5. Design & implementation of a 16 channel DAS system.

REFERENCES

1. Brey, Bary B. Microprocessor/Hardware Interfacing Applications Publishers & Distributor, Delhi.

2. Potton A. Microprocessor Based Systems Level-IV, Technical Education Council in Association with Hutchinson.

ELECTIVE EX 635 COMPUTER PROGRAMMING AND APPLICATION

L T P
2 - 4

DETAILED CONTENTS

1. Information Storage and Retrieval

   1.1 Need for information storage and retrieval

   1.2 Creating data base file.

   1.3 Querying database file on single and multiple keys

   1.4 Ordering the data on a selected key

   1.5 Programming a very simple application

2. Programming in C :

   2.1 Basic structure of C programs

   2.2 Executing a C program

   2.3 Constants, variable, and data types

   2.4 Operator and expressions

   2.5 Managing Input-Output operation like reading a character, writing a character, formatted input, formatted output through printf, scanf, getch, putch statements etc.

   2.6 Decision making and branching using IF …… else, switch goto statements.

   2.7 Decision making and looping using while, do, and for statements

   2.8 Arrays – one dimensional and two dimensional

3. Computers Application Overview

   3.1 Commercial and business data processing application

   3.2 Engineering computation

   3.3 CAD, CAM, CAE, CAI

4. Use of computer for measurement and control. Overview of a computer based data acquisition & control system. Practice in the use of the systems.

LIST OF PRACTICALS

.1 Creating database.
.2 Quering the database.
.3 Report generation.
.4 Programming in dbase.
.5 Use of spread sheets/Matlan/Mathematica/Eureka (or any other Package) for engineering computers.
.6 Use of design packages (appropriate design packages may be selected depending upon the branch)
.7 Use of CAI packages.
.8 Programming for DAS & control.
.9 Exercises on data acquisition.
.10 Exercises on control – on/off switch, and proportional control.
.11 Programming exercise on executing a C program
.12 Programming exercise on editing a C program
.13 Programming exercise on defining variables and assigning values to variables.
.14 Programming exercise on arithmetic and relational operators.
.15 Programming exercise on arithmetic expressions and their evaluation.
.16 Programming exercise on reading a character.
.17 Programming exercise on writing a character.
.18 Programming exercise on formatting input using printf.
.19 Programming exercise on formatting output using scanf.
.20 Programming exercise on simple if statement.
.21 Programming exercise on IF …….. else statement.
.22 Programming exercise on switch statement.
.23 Programming exercise on goto statement.
.24 Programming exercise on while statement.
.25 Programming exercise on do statement.
.26 Programming exercise on for statement.
.27 Programming exercise on one dimensional arrays.
.28 Programming exercise on two dimensional arrays.

ELECTIVE EX 637 ADVANCED MICROPROCESSORS

L T P
3 - 2

ROTINALE

The complex system require high through put that at times is not met with 8 bit microprocessor system. So 16 bit microprocessors based system become suitable and economical they provide better facilities to personal computers and other industrial systems in variable use 16 bit microprocessor and 8 bit microcontrollers

DETAILED CONTENTS

1. Introduction to 16 bit Microprocessors, internal architecture of 8086, internal resisters, physical & logical address generation, maximum and minimum modes, clock generation Minimum system, comparison between 8086 & 8088. (6 Hr)

2. Programming 8086: Addressing modes, instruction format, instruction templates and hand assembly. Instruction set, data transfer, arithmetic, bit manipulation, string instruction, program transfer, and processor control instructions. Assembler and assembler directives. (6 Hr)

3. Programming exercises based on the instruction set and use of assembler. (4 Hr)

4. Memory and I/O interface: Memory interface block diagram, I/O interface (direct and indirect) (4 Hr)

5. Interrupt interface of 8086 : Type of Interrupts, interrupt masking, software interrupts (3 Hr)

6. Introduction to Micro controllers. Main features, architecture, and applications of 8051. (3 Hr)

7. Introduction to 32-bit microprocessors: 80386, 80486 and Pentium. (4 Hr)

LIST OF PRACTICALS

1. Study of Instructions of 8086 using Debug.
2. Addition and Subtraction of multiply number.
3. Multiplication of unsigned/signed numbers.
4. Division of unsigned/signed numbers.
5. Sorting strings in ascending and descending order.
6. Modular programming using subroutines.
7. Study of the microcontroller 8051.

34. EX 636 MAJOR PROJECT INDUSTRY BASED

Major project work is meant for solving live problems faces by electronics industries by applying the knowledge and skills pained through the diploma course in electronics with specialisation in microprocessors. The institute offering the course will identify live problems pertaining to Electronics industries. The activity of problem identification should begin well in advance (say in the beginning of fifth semester). Students should be allotted a problem of invest to him/her as a major project work. For solving one problem there should not be more than two students in a group. The students will execute the project work under the guidance of teacher. Each teacher would not have more than 6 students for guiding major project work.

The students will be given major project assignment for a period of 6 to 8 week at a stretch in the final semester. During this project period, concerned teacher will monitor the progress of students by paying regular visits to the industry. The students will submit a comprehensive project report (in a presentable manner, preferably tayped and bound) for evaluation by the teacher guide, an expert from industry and an external examiner.

Some of the project activites are given below :

- Project related to designing small electronic equipment/instruments
- Project related to increasing productivity
- Project related to quality assurance
- Project related to estimation and economics
- Projects connected with repair and maintenance of plant and equipment
- Project related to design of PCBs
- Project related to suggesting substitutes of electronics components being used
- Project related to design of small oscillators and amplifiers circuit
- Project related to design fabrication testing and application of simple digital circuit and components
- Project related to microprocessor based circuits/instruments

- Software projects related to electronics field.

- Projects related to design, fabrication testing troubleshooting of medical electronics equipment

- Any other related problems of interested of host industry.

Assessment criteria will be as under:

-	Attendance and punctuality	15% weight, age
-	Initiative is problem solving	30%
-	Relationship with people	10%
-	Report-Writing	45%

ELECTRONIC ENGINEERING (Digital Electronics & Microprocessor System Design

DETAILED CONTENTS OF COURSES

1 to 23 Same as for ECE course, (Refer to Pages 40 to <w>)

32. EX 636 MAJOR PROJECT INDUSTRY BASED

Major project work is meant for solving live problems <w> by 'electronic' & microprocessor industries, by applying the knowledge and skills pained through the diploma course in Electronics with specialization in Digital Electronics & Microprocessor System Design. The institute offering the course will identify live problems pertaining to Electronics industries. The activity of problem identification should begin well in advance. Students should be allotted a problem of invest to him/her as a major project work. For solving one problem there should not be more than two students in a group. The students will execute the project work under the guidance of teachers. Each teacher would not have more than 6 students for guiding major project work.

The students will be given major project assignment for a period of 6 to 8 week at a stretch. During this project period. concerned teacher will monitor the progress of students by paying regular visits to the industry. The students will submit a camprehensive project report (in a presentable manner, preferably typed and bound) for evaluation by the teacher guide, <w><w> from industry and an external examiner.

Some of the project activities are given below :

- Projects related to designing small electronic equipment instruments
- Projects related to increasing productivity
- Projects related to quality assurance
- Projects related to estimation and economics
- Projects connected with repair and maintenance of <w> and equipment
- Projects related to design of PCBs
- Projects related to suggesting substitutes of electronics components being used
- Projects related to design of oscillators and amplifiers circuit
- Projects related to design fabrication of oscillators and application of simple digital circuits and components
- Projects related to microprocessor used circuit instruments
- Software projects related to <w><w>

- Projects related to design, fabrication testing troubleshooting of electronics equipment

- Any other related problems of interested of host industry.

Assessment criteria will be as under:

- Attendance and punctuality	15% weight age
- Initiative is problem solving	30%
- Relationship with people	10%
- Report-Writing	45%

33, 34 ELECTIVE I AND II

33, 34 ELECTIVE IC 534 PRINCIPLE OF AUTOMATIC CONTROL

RATIONALE

The students are required to know about the process system which is an important factor of a plant controls. In this subject introduction to theory in control systems has been given which will enable the students to understand the process control concepts to be covered in the subsequent semesters. Faculty is advised to teach the subject by citing the practical examples.

DETAILED CONTENTS

1. Introduction to Automatic Control :

Basic elements of control systems. Definition <W> terminology used in control systems. Open loop and <w> loop system concepts of feedback. Functional block diagram of a control system. Time lag, dead time, hysterisis, linearity. Self regulating and non self regulating system. Practical examples of the above

2. Block diagram and transfer Function

Review of Laplace transforms. Transfer function of simple control components like mass spring daper, thermometer single and multi-capacity processes. Single feedback configuration.

3. Time Response of Systems :

Order of systems. Test inputs, step response of Ist order and II order system - overshoot and under shoot, rise time, damping ratio. Simple example of 1 order and II order systems. Steady state response and error

4. Introduction to stability Analysis:

Characteristic equation. ‘Rouths’ table Nyouist <w> phase margin and gain margin. Relative stability.

5. Routh – Hurwitz criterion

Root <LOCUS> technique :

Bode Plot

Polar Plot
Sain margin and Phase margin

LIST OF PRACT1CALS

1. To find time lag, overshoot and other parameters or both the above circuits

2. To design and fabricate a first order system for temperature or flow or pressure of level from simulated input.

3. To find transfer function of RC circuit by Bode plot.

4. To study LVDT

5. To study torque speed characteristic or AC servo motor <w> help of magnetic/mechanical loading.

6. To study synchro

7. To study stepper motor.

8. To study the frequency domain technique using MATLAD of <w>

Bode plot, Polar plot, Root locus. Time lag, Routh <w>

33, 34 ELECTIVE IC 643 PROCESS CONTROL AND INSTRUMENTATION

RATIONALE

DETAILED CONTENTS

1. Basic Central Loops and Characteristics :

   Simple processes 1ike : —

   - single capacity pressure system
   - single capacity temperature system
   - single capacity Level system
   - single flow loop system
   - dead time process lag – first order approx of process system.

2. Basic Controller Modes:

   Concept of on - off and throtting <w>

   - On – off ,proportional
   - Single speed floating, action
   - Integral and derivative action and their combination <w> their response to step ramp and sinusoidal test inputs

   Examples of on – off control systems

Example of simple systems using. Single speed floating P, P+I, P+I+D mode of control. Relative merit of P+I and P+I+ modes of control. Relative merit of the above modes of control suitability of various control actions for different application.

3. Multiloop Control:

   Introduction to feed forward, cascade and ratio control.

4. Controller Adjustment:

   Alignment and tuning, Ziegler – nichol’s method

5. Sequencey and interlock,concept <w> interlocking- applicable to system.

6. Case Study:

   Boiler plant control instrument <w>
   Distillation column control

Introduction to ROBOTICS, COMPUTER CONTROL OF <w>

Computer control system.

PRACTICALS

1. To demonstrate on a simple system the principle of the working of synchros.

2. To rig up a driver circuit for a stepper motor and <w> its working.

3. To rig up an electronic PID controller circuit and <w> step and ramp input for a proportional bend of 50%

4. To obtain the output of a pneumatic PID controller

5. To study and obtain input/output relation of a <w> relay.

6. To study and set a pneumatic PID controller.

7. To obtain input/output of an elctropneumatic converter.

8. To study the control loop for a tank level control.

9. To determine the differential gap, amplitude, frequency <W> oscillation of an on – off thermal system.

10. To determine the output response of thermal PID control System for a stop input when P+I action is provided.

33, 34 <w> in 432 principles of instrumentation & <w>

L T P
3 - 2

RATIONALE

This syllabus has been designed to make a base for Understanding of instrumentation technology. The basic principles involved in instrumentation, displays etc, are included in the syllabus. The students will be able to identify different types of instruments, sensors and transducers used in the field of instrumentation. The students will also be able to select appropriate transducers relating to process that will <W> know about the conditioning of a signal from a <W> the purpose of indication/control. Faculty is advised to <w> them and make them familiar will tranducers while covering the topic.

DETAILED CONTENTS

1. Basic Building blocks of any instrumentation <w>

   - Scope and necessity of instrumentation.
   - Neames of important process variables, their units.
   - Building blocks of instrumentation system.
   - Various testing signal.
   - Controlling system and controllers
   - Display system : Analog and digital
   - Typical specification to be given <w> instrument.

2. Performance Characteristics of Instruments

   - Concept of time constant, response time, nature Frequency, damping coefficient.
   - Order of instruments
   - Step response of different of <w >of <w><w>

3. Display Means

   - Various indicating, integration and <w> <w> their combination

<L>

- Basic of printing devices.
- Scanning and data logging

4. Basics Definition

   Classification – definition of terms used – accuracy, Precision, sensitivity, linearity, hysterisis etc, selection Criteria of tranducers.

5. Variable Resistance Tranducers

   - Basic principles; potentiometrs strain <w> Cells – temperature compensation – applies <w>
   - Hot wire anemometers: photo <w> <w> <w>
   - Resistive temperature transducers,
   - Thermistors and their circuit; carbon <w>

6. Variable Inductance Transducers

   Basics principles, EI pick ups induction potentiometers <W> (linear variable differential transformer) <w> reluctance accelerometers

7. Variable Inductance Transducers:

   Basic principles, capacitance <w> <w> microphones, differential capacitance pick <w> conditioning circuits. Measurement of pressure <w> moisture etc<w>

8. Piezo Electric Transducers

   Piezoelectric crystals and their properties, general general <w> of piezoelectric transducers, accelerometers, jerk <w>, <w>

9. Magnetostrictive transducers

   Magnetoelastic property of nichel and <w> <w> of force, acceleration, torque.

10. Other transducers

    - Based on Hall effect, <W> current <W>
    - Optical transducers
    - Digital transducers, single shaft <W>

- Thermocouple sensor, photo voltaic cell.
- Tachogenerator
- Synchros (Selsyns)
- Selection of sensors for measurement of following Parameters : Temperature, pressure, flow and level vibration, displacement speed.

11. Principles of operation, construction details and transfer functions of : Electrical components like limit switches, polentiometer, synchros, auto transformer, servomotors (DC & AC), stepper motor, magnetic amplifiers, operation amplifiers, application to typical servo system.

12. Pneumatic components; flapper nozal system, bellows & relays Lock up relays,

    Hydraulic components: principle of operation of hycraulic amplifier, electropnuematic relays; construction are application, control valves and actuators – concept are type of control valves and their characteristics, principles of operation and constructional details of solenoid valve motor operated valve diapharagm operated valves, power cylinders, piston operated valve. Handwheel <w> control valves and its application selection of valves CV Cb factors.

LIST OF PRACTICALS

1. Study of strain gauge and measurement of strain in given sample.
2. Study of synchro transmitter and receiver
3. Study of piezoelectric pressure transducer
4. Study and calibration of L.V.D.T.
5. Study of variable capacitive transducer
6. Study of variable inductive transducer
7. Study of servomoter
8. Study of pneumatic control valve
9. Study of solenoid valve and motor operated valve.
10. Study of optical transducer.

(vi) Detailed Contents – Electronic Engineering
(Medical Electronics)

Sr. Nos. 1 to 24 common with ECE Course
(Refer to pages 42 to 108)

28. EX 540 IMAGING TECHNIQUES AND EQUIPMENT

RATIONALE

The study of this subject will help the students to <w> knowledge of factions, working principles, constructing application and maintenance aspects of biomedical equipment <w> upon X-ray and imaging techniques.

DEDTAILED CONTENTS

1. X-Rays:

Origin and nature of X-rays. Units and properties of X-rays,

X-ray circuit:

(a) Basics components
(b) Basics X-ray machines
(c) Modern X-ray tubes
(d) Types of anodes and anode supply
(e) Filament supply
(f) Timing Devices
(g) Interlock, and safety devices
(h) Types of X-ray machines

Image Intensifier System:

(a) X-ray image intensifier tube
(b) C.C.T.V
(c) High voltage supply
(d) Optical coupling system
(e) Fluoroscopy

2. Ultrasound Instrumentation:

Basic principles of ultrasonic. Doppler principle. Units of ultrasound machine and their operation, Foetal monitor. Pulse echotechnique. Pulse echo-instrument and Echoencephalography, Computed sonography – block diagram and advantage.

3. Computed Tomography (CT):

Principle of operation. Block diagram of CT scanner Units of CT scanner. Features of scanner.

4. Medical Resonance Imaging (MRI):

Principle of MRI. Superconductivity and MRI. <w> Diagram of MRI. Advantage of MRI over C.I.

5. Digital Subtraction Angiography :

Principle or operation, Components of digital radiography system. Block diagram and operation .Advantages of Digital subtraction angiogram over conventional anglogram.

6. Nuclear Medicine Instruments:

Types of radioactive particles. Radiation detectors Radioisotope scanners for medical application Gamma <w> - Components and working principle. Advantages and disadvantages of gamma scan.

LIST OF PRACTICALS :

1. Operation and functions of all controls of hospital based X-ray machine.

2. Identification of different blocks/subsystem circuits in X-ray machine.

3. Measurment of EHT in X-ray machines.

4. Film Processing (expose and develop the X-ray film).

5. Study of ultrasound, tranducer operation.

6. Identification of different units of ultrasound machine.

7. Study of operating console and feature of ultrasound machine.

8. Development of ultrasound investigation film.

29. EX 541 BASIC MEDICAL ELECTRONICS

RATIONALE

The knowledge of the subject is required as a basic input for specification in biomedical equipment and instuments. The students will be made aware of the various types of basic loops and equipment such as electrodes, transducers, waveform display devices, circulatory, respiratory and therapeutic equipments.

DETAILED CONTENTS

1. Overview of Medical Electronic Equipments:

   Classification application and specification of diagnostic therapeutic and clinical laboratory equipments.

2. Electrodes:

   Elementary idea of cell structure Bioelectric <w> electrodes Electrodes – tissue interface <w> impedence. Effect of high contact imbedence types electrodes. Electrodes for ECG.CMG and EEG.

3. Transducers:

   Typical signals from physiological parameter. Pressure transducers – types of pressure tranducers. Flow tranducers. Temperature tranducers – Thermo couples, thermistors. Pulse sensors. Respiration sensors biomedical signal processor Physiological preamplifier and specialized amplifier.

4. Waveform Display DEVICE :

   PMMC instruments. Servo— recorders and recording potentio-maters. X-Y recorders. Dot matrix analog recorders. Oscilloscopes - medical oscilloscopes, Bedside monitor, multibeam oscilloscopes, -<W>nonface oscilloscopes, modern oscilloscope designs.

5. Circulatory System and <w> Equipments :

   The Heart. Electroconduction system of the heart. ECG <w> form. The standard lead system. ECG machine- block diagram, working principles. Defibrillator types, circuit and testing of defiri1lator, Pacemaker. - operation and classifications Heart lung machine.

6. Respiratory System and. Related Equipments :

The human respiratory system. Internal and external respiration. Organs of respiratory system. Mechanic of breathing. Parameters of respiration and their measurement. Impedance pneumograph, spirometers.

Therapeutic equipments

Intermittent positive pressure breathing (IPPB) respirator - functional block diagram. Artificia1 ventilations - Humidifiers nebulizer.

7. Nervous System and Related Equipments :

The Neuron structure and function of the central nervous system. Cerebral angiography. Electroencephalography. EEG electrode system EEG amplitude and frequency bands. EEG system block diagram, preamplifier, specification, Multichannel EFG recording systems and typical external controls.

8. Musculatory System and Related Equipments :

Muscle action EMG machine - different units and working principle. Physiotherapy - short wave diathermy, ultrasonic diathermy, microwave diathermy unit. Stimulators - types and applications.

LIST OF PRACTICALS

1. Measurement of skin contact impedance and techniques to reduce it

2. Determine the contact impedance of following electrodes ; ECB, EEG, and EMG machines.

3. (a) Taking ECS of a subject.
   (b) Observation of artifacts in ECG recording.

4. Use of oscilloscope as cordioscope with and without memory.

5. Measurement of heart rate, with ECG machine, cardioscope and heart rate meter.

6. Direct blood pressure measurement (under stimulated conditions).

7. Placement of EEG electrodes. Study of different units of EEG machine.

8. Taking EEG of a subject and observing artifacts in EEg recording.

9. Study of EMG machine – different controls and units.

30 EX 642 MEDICAL, ELECTRONICS – I

L T P
3 - 2

RATIONALE

The students is made aware of the functions, working principles, construction, merits and application of various biomedical, equipments and interments , such as laboratory centrifuges, incubators, clinical laboratory instruments calorimeters, flame photometers, PH meters, microscopes, operation room equipment and neonatal instruments.

DETAILED CONTENTS

1. Laboratory Centrifuges:

   Parts of centrifuges. Speed control in centrifuges. Trouble Shooting in centrifuges. Refrigerated centrifuges.

2. Incubators and Ovens:

   Types of incubators and ovens. Temperature control of incubators and ovens. Trouble shooting incubators and ovens.

3. Basic Components of Clinical Laboratory Instruments:

   Electromagnetic spectrum. Light source, Photodetectors. Monochromators. Display system.

4. Colorimeter:

   Basic parts of colorimeters, testing individual colorimeter Parts. Calibration procedures. Auto analyzer.

5. Flame photometers:

   Emission system. Optical system. Calibration of flame photometer, spectrophotometer.

6. PH Meters:

   Types of PH meters (analog and digital types) typical PH Circuits. Testing and calibration of PH meters. PH electrodes.

7. Blood cell Counters:

   Basic block diagram. Working principle and maintenance.

8. Electrophoresis Apparatus :

   Electrophoresis technique. Electrophoresis apparatus. High voltage power supply.

9. Electron Microscope:

   Overview of optical microscope. Block diagram of electron microscope. Working principle and application in medical field.

10. Operation Room Equipments:

    Electrosurgery Machine, Electrosurgery circuit, testing and safety of electrosurgery units. Sterilization and anesthesia machines.

11. National Instruments:

    Inhalation therapy and the newborn. Mist therapy, oxygen therapy. Neonatal incubators. Photolight therapy.

LIST OF PRACTICALS

1. Operation and testing the parts of centrifuge.
2. Operation and testing the parts of an incubator.
3. Operation and testing the parts of colorimeter.
4. Testing of a blood sample using colorimeter.
5. Measurement on simulated samples with aflame photometers.
6. Identification of different types of pH electrodes.
7. Use and calibration of PH meters.
8. Familiarization with Electrophoresis apparatus and its different units.
9. Familiarization with different units of electron microscope and its operation.
10. Study of different controls of auto analyzer and its operation.
11. Familiarization with different units of blood cell counter and its operation.
12. Operation and testing the parts of spectrophotometer.

31 EX 642 MEDICAL ELECTRONICS – II

L T P
3 – 2

RATIONALE

The students is made fully conversent with the functions, working principle, construction, merits and applications through the study of this subject in continues of the subject medical electronics I. Various equipment to be covered with the based upon fiber optics, laser, biotelemetry, computers, pasents monitering and so on.

DETAILED CONTENTS

1. Fibre Optics Equipments:

   Principle of fibre optics. Fibre optics. Fibre optics communication system, advantages of fibre optics system. Application of fibre optics in medical field – fibre optics, Endoscopy, fibre optics bronchoscopy.

2. Laser Equipments:

   Review of laser operation. Application of laser in diagnosis and therapy. Photodynamic therapy (PDT) of cancer.

3. Biotelemetry:

   Introduction to biotelemetry. Physiological parameters adaptable to biotelemetry. Components of bitelemetry System. Implantable units. Application of telemetry in medical field – EGC telemetry, EEG telemetry. Biolink Pulse width modulation – transmitter and receiver.

4. Patient Monitoring System:

   Heart rate measurement, pulse rate measurement. Respiration rate measurement. Blood pressure measurement. Patient monitoring by microprocessor controlled system.

5. Computers in Biomedical Equipment:

   Review of operation of computers and programming languages. Interface between analog signals and digital computers. Computers in automated medical information system. Computer analysis of ECG, cardiac catheterization parameters, pulmonary functions, computer averaging in electroence – pnalographic evoked response, computer <w> of clinical lab chemical tests. Central monitoring console <w> ICU.

6. Electromagnetic Interference (EMI) in Medical Electronic Equipments:

Introduction, Intermodulation problems and solutions, Dealing with television interference (TVI). Dealing with signal over, load problems. ECG equipment and Emi, EMI <W> to biomedical sensors.

7. Medical Equipment Maintenance:

Management, facilities and equipments for maintenance, Maintenance of battery operated medical equipments.

Trouble shooting and maintenance of following equipment:

- X-ray machines
- Ultrasound machines
- ECG machines
- EEG machines
- Respiratory equipments
- Defibrillators and pagemakers
- Clinical equipments
- Surgical equipment.

8. Safety in the Medical Environment:

Electrical safety – Gross current shock, micro current shock, Special designs for safety considerations. Safety standard. Safety testing instruments. Electrosurgery safety.

Radiation safety – biological effects of X-ray. Personnel radiation monitoring and film badges.

Safety considerations in critical care areas, operation rooms and catheterization labs.

9. Selected Topics:

Mammography, thermography, Electrodynogram (EDG) system, dialysis machines.

LIST OF PRACTICALS

1. Study of fibre optics communication system and parameters of optical fibre.

2. Heartrate measurement using cardiot <w>

3. Respiratory rate measurement.

4. Blood pressure measurement using indirect method.

5. Trouble shooting of X-ray machine.
6. Trouble shooting of ECG Machine.
7. Troub1e shooting of EEG machine.
8. Trouble shooting of ultrasound machine.

32. EX 636 MAJOR PROJECT INDUSTRY BASED

Major project work is meant for so1ving 1ive prob1es; faced by electronics industries by applying the knowledge and skills gained through the diploma course in electronics with specialisation in microprocessor and medical e1ectronics. The institute offering the course will identify live problems pertaining to Electronics industries. The activity of problems identification should begin well in advance (say in the beginning of fifth- semester). Students should be allotted a problem of invest to him/her as a major project work. For solving one problem there should not be more than two students in a group. The students will execute the project work under the guidance of teachers. Each teacher would not have more than 6 students for guiding major project work.

The students will be given major project assignment for a period of 6 to 8 week at a stretch in the final semester. During this project period, concerned teacher will monitor the progress of students by paying regular visits to the industry. The students will submit a comprehensive project report (in a presentable manner, preferably tayped and bound) for evaluation by the teacher guide, an expert from industry and an external examiner.

Some of the project activites are given below:

- Projects related to designing small electronic equipment, instruments.
- Projects related to increasing productivity.
- Projects related to quality assurance.
- Projects related to estimation and economics.
- Projects connected with repair and maintenance of plant and equipment.
- Projects related to design of PCBs.
- Projects related to suggesting substitutes of electronic, components being used.
- Projects related to design of small oscillators and amplifiers circuit.
- Projects related to design fabrication testing and application of simple digital circuits and components.
- Projects related to, microprocessor based circuit instruments.
- Software projects related to e1ectronics fie1d.

- Projects related to design fabrication testing troubleshooting of medical electronics equipment.

- Any other related problems of interested of host industry.

Assessment criteria will be as under:

-	Attendance and Punctuality	15% weightage
-	Initiative in problem solving	30%
-	Relationship with people	10%
-	Report –Writing	45%

ENVIRONMENT AWARENESS CAMP

A diploma holder must have knowledge of different types pollution caused due to industries and constructiona1 activities so that he may help in balancing the eco system and control pollution by pollution controlling measures. He should also be aware of environmental laws for effectively control1ing pollution of environment.

DETAILED CONTENTS

This is to be organised at a stretch for 2 to 3 days. Lecture will be delivered on following broad topics. There will be examination for this subject.

1. Basics of ecology, eco system and sustainable development.
2. Conservation of land reforms, preservation and species prevention of advancement of deserts and lowering of water-table.
3. Sources of pollution - Natural and man made, their effect or living and non living organisms.
4. Pollution of water - causes, effects of domestic wastes industria1 effluent on living and non living organisms.
5. Pollution of air - causes and effects on man, animal vegetaton and non living organism.
6. Sources of noise pollution and its effects.
7. Mining, blasting, deforestation and their effects.
8. Legislation to control environment.
9. Environment impact assessment (EIA), elements for preparing; EIA statement.

5. ES 123 Electronic Devices and Circuits – I

L T P
3 1 3

RATIONALE

The course provides the students with Basic understanding of the principles of common electronic devices and circuits of importance. The knowledge regarding the application of various circuits and devices.Practica1 experience in the design, fabrication and testing of circuits.

DETAILED CONTENTS

1. Introduction (3 Hr)

Introduction to active and passive components, passive components, fixed and variable resisters their various types and specializations including thermistors, LDR and VDR fixed and variable capacitors, their various types and important specifications and colours codes.

2. Semiconductor Physics (5 Hr)

Intrinsic semicronductors - Conductivity, atomic and crystal structure of germanium and silicon, covalent bonds, genertion and recombination, effect of temperature on conductivity of intrinsic semiconductors; energy level diagrams of conductor, insulator and intrinsic semiconductors. Extrinsic semicondutors materials - <w> of impurity, P and N type semiconductors and the conductivity. Minority and majority carriers; Draft <W> Diffusion currents.

3. Semiconductor Diode : (5 Hr)

P-N junction diode, mechanism of current flow in P-N junction, drift and diffusion current.<w> layer, potentia1 barrier, behaviour of P-N junction characteristics, zener and avalanche breakdown, concept; junction capacitance in foward and reverse bias condition <W>.

Semiconductor diode characteristics, static and dynamic resistance and their calculation from diode characteristics. Dynamics resistance of diode in terms of diode current.

$$r_D = 25/I_D$$

Diode (P-N junction) as rectifier, half wave rectifier. full wave rectifier including bridge rectifier, relationship between D.C. output voltage and A.C. input voltage rectification efficiency and ripple factor for.<w> circuits, fi1ter circuits : Shunt capacitor.<w>inductor, capacitor input, filter, bleeder resistance,