GOVERNMENT POLYTECHNIC NASHIK

(AN ACADEMICALLY AUTONOMOUS INSTITUTE OF GOVT. OF MAHARASHTRA)

CURRICULUM - 2016

DIPLOMA PROGRAMME
IN
ELECTRONICS & TELECOMMUNICATION ENGINEERING

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PREFACE

Government Polytechnic, Nashik is established in 1980. The institute has been conferred an academically autonomous status in 1995 by Government of Maharashtra because of excellent performance.

The vision of the institute is to be a premier technical training and development institute catering to the skill and professional development in multi-domain for successful employment / self-employment by offering certified and accredited NSQF compliant programmes. The institute shall be the center for excellence in skill development and community development through different training programmes, business incubation and entrepreneurship development. For this the institute is committed to provide education for skill development, engineering diploma and continuing education programmes for enhancement of employability skills of the aspirants in the job/self-employment through continually developing quality learning systems. The institute aims at holistic and student centric education in collaboration with business, industry and having practice based education. To achieve this continuous efforts are made to design the curriculum considering the latest development in the industrial sector and technology.

The three year Diploma Programme in Electronics & Telecommunication Engineering is being offered since 2002. First curriculum was implemented in 2002 under academic autonomy and subsequently it was revised and implemented in 2007, 2011. The curriculum revision is a regular activity and outcome based education approach is adopted for designing the curriculum. The revised outcome based curriculum is designated as "Curriculum 2016". The implementation of Curriculum 2016 will be effective from the academic year 2016- 17.

For designing the curriculum, the various domains have been identified in Electronics & Telecommunication Engineering Programme. These domains are Consumer Electronics, Telecommunication, Industrial Automation, Industrial/Power Electronics, Medical Electronics, Mechatronics, Computer System and Peripherals, Service and Repair. The questionnaire has been designed to get the responses from these domains. The feedback of different stake holders i.e. industries, teachers and students has been analysed. Further, the roles, functions, activities, tasks and attitudes necessary for Diploma Electronics and Telecommunication Engineer have been identified. The programme structure is finalised and the content detailing of individual course has been carried out by group of experts, and approved by Programme Wise Committee (PWC), Board of Studies (BOS) and Governing Body (GB).

In this Curriculum-2016, the student has to acquire 200 credits for successful completion of Diploma Programme. The courses of curriculum are structured at different 5 levels i.e. Foundation Courses, Basic Technology Courses, Allied Courses, Applied Technology Courses and Diversified Courses.

The minimum entry level is 10th. However, the curriculum provides "Multi Point Entry and Credit system (MPEC)" for the students opting admission after passing 12th, ITI, MCVC. At higher entry level, the students will get exemptions in certain courses as per the rules.

There is flexibility to opt the courses as per the choice of students. The curriculum provides "Sample Path" as a guide line for selection of courses in each term for entry level as 10th. The List of Courses for Award of Class after completion of Diploma Programme is prescribed separately in this curriculum.

The fulfilment of programme outcome as stated in the Curriculum-2016 will depend on its effective implementation. The teachers who are implementing the curriculum were also involved in the design process of curriculum, hence, I hope that the Curriculum-2016 will be implemented in effective way and the passouts will acquire the requisite knowledge and skills to satisfy the industrial needs.

(Prof. DNYANDEO PUNDALIKRAO NATHE)
Principal
Government Polytechnic, Nasik

GOVERNMENT POLYTECHNIC NASHIK

VISION

To be a premier technical training and development institute catering to the skill and professional development in multi-domain for successful employment/self-employment by offering certified and accredited NSQF compliant programmes. The institute shall be the center for excellence in skill development and community development through different training programmes, business incubation and entrepreneurship development.

MISSION

The Government Polytechnic Nashik, an autonomous institute of Government of Maharashtra has the mission to provide education for skill development, engineering diploma and continuing education programmes for enhancement of employability skills of the aspirants in the job/self-employment through continually developing quality learning systems. The institute aims at holistic and student centric education in collaboration with business, industry and having practice based education.

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

VISION

"To be the Centre for Electronics and Telecommunication Engineering Supporting to the Multi-Disciplinary Problem Solving through Outcome and Practice based Environment and with Focus up on the Requirements of Digital India."

MISSION

Department of Diploma in Electronics and Telecommunication Engineering is committed

M1. To Provide Diploma Engineering Education and Skill Education for Manpower to the Industry and Society
M2. To Inculcate Entrepreneurship Abilities
M3. To Prepare Life-Long Learners by Creating the Outcome and Practice Based Learning Environment
M4. To Develop Professionalism, Ethics and Good Individual Citizen.

JOB PROFILE OF DIPLOMA ELECTRONICS AND TELECOMMUNICATION ENGINEERS

A Diploma Electronics and Telecommunication Engineer has to carry out various activities in various areas during his implementation of engineering knowledge.

Electronics and Telecommunication Engineering job opportunities are available in following domains:

a. Consumer Electronics
b. Telecommunication
c. Industrial Automation
d. Industrial/Power Electronics
e. Medical Electronics
f. Mechatronics
g. Computer systems and Peripherals
h. Service and Repair

In above domain areas Diploma Electronics and Telecommunication Engineer has to perform following duties and functions.

1. Skilled Engineer
2. Supervisor
3. Testing Engineer
4. Engineer in Railway Department
5. Maintenance Engineer
6. Service Engineer
7. Instructor in various Institutes
8. Maintenance / Quality Assurance Supervisor
9. Entrepreneur
10. Store Officer
11. Sales and Marketing Engineer

DIPLOMA PROGRAMME IN ELECTRONICS & TELECOMMUNICATION ENGINEERING

RATIONALE:

In today's world everyone is familiar with electronics and communication equipments and they have become very important in life. Demand of Electronics and Telecommunication Engineer is increasing day by day in residential, commercial, industrial, agricultural areas.

Expert manpower is needed for research, installation, testing, operation and maintenance of equipments.

The program of Diploma in Electronics and Telecommunication Engineering is aimed to produce professional engineers to undertake various rolls in above areas and various departments in industry**.**

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Electronics and Telecommunication Engineering Department will produce the engineers who:

I. Are Competent Entrepreneurs, Highly Valued Professionals with Life-Long Learning Skills.
II. Act with Societal, Environmental, and Commercial Awareness.
III. Grow Professionally in their Careers through Continued Development of Technical and Management Skills.

PROGRAMME OUTCOMES (POs)

On successful completion of Diploma Programme in Electronics & Telecommunication Engineering, the passouts will be able to,

a. **Basic Knowledge:** Apply the basic knowledge of differential equations, vector calculus, complex variables, matrix theory, probability theory, basic sciences and fundamentals of Electronics and Telecommunication Engineering.

b. **Discipline Knowledge:** Identify, analyze and solve Electronics and Telecommunication Engineering problems upto the substantiate conclusions.

c. **Experiments and Practice:** Design and implement electronic circuits and to analyze, interpret and experimentally validate the results.

d. **Engineering Tools:** Model and simulate analog and digital systems using appropriate technologies and software tools.

e. **The Engineer and Society:** Apply the knowledge of societal aspects and related responsibilities while working in industries, research laboratories and multidisciplinary tasks.

f. **Environment and sustainability:** Use modern engineering tools, software's and equipments to analyze the impact of engineering solutions in societal and environmental contexts.

g. **Ethics:** Apply ethical principles and knowledge for the benefits of society and industries.

h. **Individual and Teamwork:** Work effectively as an individual and member or a leader in multidisciplinary teams.

i. **Communication:** Communicate effectively in society and engineering community through verbal and written form.

j. **Project Management and Finance:** Manage projects in multidisciplinary environment by applying the knowledge of engineering and management principles with the ability of continuous learning.

k. **Life-long Learning**: Be an entrepreneur or to seek employment in the industry, public sector undertakings and government organizations with the adaptability of lifelong learning in the context of technological changes.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On successful completion of Diploma Programme in Electronics & Telecommunication Engineering, the student will be able to,

PSO 1. Use basic concepts in various domains of Electronics and Telecommunication Programme such as Applied Electronics, Analog and Digital communication, Digital and Embedded Systems, Industrial Instrumentation and Automation.

PSO 2. Apply and upgrade the knowledge in order to develop electronic products and systems

PSO 3. Work effectively on various technical projects to satisfy the industrial needs.

PSO 4. Utilize the engineering practices with professional ethics for societal and environmental wellbeing.

MAPPING OF MISSION AND PROGRAMME EDUCATIONAL OBJECTIVES

Sr. No.	Mapping Point No.	Component of Mission Statement	PEO/s No.
1	M1	To Provide Diploma Engineering Education and Skill Education for Manpower to the Industry and Society	I
2	M2	To Inculcate Entrepreneurship Abilities	I
3	M3	To Prepare Life-Long Learners by Creating the Outcome and Practice Based Learning Environment	I
4	M4	To Develop Professionalism, Ethics and Good Individual Citizen.	II & III

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES AND PROGRAMME OUTCOMES

Sr. No.	Programme Educational Objectives (PEOs)	Programme Outcomes (POs)
1	I. Are Competent Entrepreneurs, Highly Valued Professionals with Life-Long Learning Skills.	a, b, c, d, e, f, h, j, k
2	II. Act with Societal, Environmental, and Commercial Awareness.	g, h, i
3	III. Grow Professionally in their Careers through Continued Development of Technical and Management Skills.	g, h, i

MAPPING OF PROGRAMME SPECIFIC OUTCOMES AND PROGRAMME OUTCOMES

Sr. No.	Programme Specific Outcomes (PSOs)	Programme Outcomes (POs)
1	I. Use basic concepts in various domains of Electronics and Telecommunication Programme such as Applied Electronics, Analog and Digital communication, Digital and Embedded Systems, Industrial Instrumentation and Automation.	a, b, c, d, e, f, g, h, i, j, k
2	II. Apply and upgrade the knowledge in order to develop electronic products and systems	c, d, j, k
3	III. Work effectively on various technical projects to satisfy the industrial needs.	a, b, c, d, e, h, i, j
4	IV. Utilize the engineering practices with professional ethics for societal and environmental well being.	a, b, c, g, h, i, j, k

MAPPING OF PROGRAMME OUTCOME AND COURSES

Sr. No.	Programme Objectives (POs)	Courses
a.	**Basic Knowledge:** Apply the basic knowledge of differential equations, vector calculus, complex variables, matrix theory, probability theory, basic sciences and fundamentals of Electronics and Telecommunication Engineering.	Basic Mathematics Engineering Mathematics Applied Mathematics Applied Physics Applied Chemistry Fundamentals of Electrical Technology Basic Electronics Analog Communication Computer Applications Engineering Graphics
b.	**Discipline Knowledge:** Identify, analyze and solve Electronics and Telecommunication Engineering problems upto the substantiate conclusions.	Electronic Material and Components Applied Electronics Digital Electronics Electronics Measurement and Instruments Industrial Instrumentation Digital Communication Data Communication Advance Communication Systems Mobile Communication Antenna and Microwaves
c.	**Experiments and Practice:** Design and implement electronic circuits and to analyze, interpret and experimentally validate the results.	Engineering Workshop Practice Electronic Workshop Practice Linear Integrated Circuits Industrial Electronics and Applications Audio Video Engineering Control System and PLC Industrial Automation
d.	**Engineering Tools:** Model and simulate analog and digital systems using appropriate technologies and software tools.	C Programming, Embedded System Design Mechatronics: Components and Systems Microcontroller 8051 Advanced Microcontroller VLSI Techniques .NET Technology Computer Hardware and Networking Process Control and SCADA System
e.	**The Engineer and Society:** Apply the knowledge of societal aspects and related responsibilities while working in industries, research laboratories and multidisciplinary tasks.	Professional Practice Development of Life Skills
f.	**Environment and sustainability:** Use modern engineering tools, software's and equipments to analyze the impact of	Environmental Studies Renewable Energy Sources

Sr. No.	Programme Objectives (POs)	Courses
	engineering solutions in societal and environmental contexts.	
g.	**Ethics:** Apply ethical principles and knowledge for the benefits of society and industries.	Industrial Organization and Management Entrepreneurship Development
h.	**Individual and Teamwork:** Work effectively as an individual and member or a leader in multidisciplinary teams.	Supervisory Skills Marketing Management
i.	**Communication:** Communicate effectively in society and engineering community through verbal and written form.	Communication Skills Development of Life Skills Seminar
j.	**Project Management and Finance:** Manage projects in multidisciplinary environment by applying the knowledge of engineering and management principles with the ability of continuous learning.	Project Engineering Workshop Practice Electronic Workshop Practice Entrepreneurship Development
k.	**Life-long Learning**: Be an entrepreneur or to seek employment in the industry, public sector undertakings and government organizations with the adaptability of lifelong learning in the context of technological changes.	All Courses

PROGRAMME - DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING
CURRICULUM STRUCTURE

SCHEME AT A GLANCE

Level	Name of Level	Total Number of Courses offered	Number of Courses to be completed	TH	TU	PR	Total Credits	Marks
Level-1	Foundation Courses	12	12 Compulsory	29	02	26	57	1200
Level-2	Basic Technology	08	08 Compulsory	30	--	24	54	1175
Level-3	Allied Courses	07	05 (03Compulsory + 02 Electives)	10	--	04	14	400
Level-4	Applied Technology	08	08 Compulsory	14	--	24	38	825
Level-5	Diversified Technology	12	06 (03 Compulsory + 03 Electives)	23	--	14	37	900
TOTAL		**47**	**34 Compulsory +05 Electives -- 39**	106	02	92	200	4500
Grand Total		**47**	**39**	106	02	92	200	4500

Abbreviations:
TH: Theory, TU: Tutorial, PR: Practical.

PROGRAMME - DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING
PROGRAMME STRUCTURE
LEVEL - 1
FOUNDATION COURSES

Sr. No.	Course Code	Course Title	Course Abbr	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6101	Communication Skills	CMS	03	--	02	05	03	80	20	--	--	50	150
02	6102	Development of Life Skills	DLS	01	--	02	03	--	--	--	--	--	50	50
03	6103	Basic Mathematics	BMT	03	01	--	04	03	80	20	--	--	--	100
04	6104	Engineering Mathematics	EMT	03	01	--	04	03	80	20	--	--	--	100
05	6105	Applied Physics	PHY	04	--	02	06	02#	80#	20#	--	--	50	150
06	6106	Applied Chemistry	CHY	04	--	02	06	02#	80#	20#	--	--	50	150
07	6107	Engineering Graphics	EGR	02	--	04	06	--	--	--	25	--	25	50
08	6113	Fundamentals of Electrical Technology	FET	04	--	02	06	03	80	20	--	--	50	150
09	6114	Electronic Workshop Practice	EWP	--	--	04	04	--	--	--	--	--	50	50
10	6115	Computer Applications	COA	01	--	02	03	--	--	--	--	--	50	50
11	6116	Electronic Material and Components	EMC	04	--	02	06	03	80	20	--	25	25	150
12	6127	Engineering Workshop Practice	EWS	--	--	04	04	--	--	--	--	--	50	50
TOTAL				**29**	**02**	**26**	**57**	--	**560**	**140**	**25**	**25**	**450**	**1200**

Level : 1

Total Courses : 12
Total Credits : 57
Total Marks : 1200

Abbreviations :

Abbr : Course Abbreviation, TH : Theory, TU : Tutorial, PR: Practical, OR : Oral, TW : Term Work

Course code Indication:

Example : 6101
First digit : 6 : Indicates last digit of Year of Implementation of Curriculum
Second digit : 1 : Indicates Level.
Third & Fourth digit : 01 : Indicates Course Number.

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) Other TW are to be assessed by internal examiner only.
3) # indicates online progressive test and end examination

PROGRAMME - DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING
PROGRAMME STRUCTURE
LEVEL - 2
BASIC TECHNOLOGY COURSES

Sr. No.	Course Code	Course Title	Course Abbr	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6244	Basic Electronics	BTX	04	--	04	08	03	80	20	25	--	25	150
02	6245	Electronic Measurement and Instruments	EMN	03	--	02	05	03	80	20	--	25	25	150
03	6246	Industrial Instrumentation	INI	04	--	02	06	03	80	20	25	--	25	150
04	6247	Digital Electronics	DEX	04	--	04	08	03	80	20	25	--	25	150
05	6248	Linear Integrated Circuits	LIC	04	--	04	08	03	80	20	25	--	25	150
06	6249	Analog Communication	ACO	04	--	02	06	03	80	20	25	--	25	150
07	6250	Industrial Electronics and Applications	IEA	04	--	04	08	03	80	20	25	--	25	150
08	6251	C Programming	CPG	03	--	02	05	03	80	20	--	--	25	125
TOTAL			--	**30**	**--**	**24**	**54**	**24**	**640**	**160**	**150**	**25**	**200**	**1175**

Level: 2

Total Courses : 08
Total Credits : 54
Total Marks : 1175

Assessment of PR / OR / TW:

1) All orals & practicals are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING
PROGRAMME STRUCTURE
LEVEL - 3
ALLIED COURSES

Sr. No.	Course Code	Course Title	Course Abbr	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6301	Applied Mathematics	AMT	03	--	--	03	03	80	20	--	--	--	100
02	6302	Environmental Studies	EVS	--	--	02	02	--	--	--	--	--	50	50
03	6303	Industrial Organization and Management	IOM	03	--	--	03	03	80	20	--	--	--	100
Elective I : Any **ONE** of the following														
03	6305	Supervisory Skills	SSL	03	--	--	03	03	80	20	--	--	--	100
	6306	Marketing Management	MKM	03	--	--	03	03	80	20	--	--	--	100
Elective II : Any **ONE** of the following														
04	6309	Entrepreneurship Development	EDP	01	--	02	03	--	--	--	--	--	50	50
	6310	Renewable Energy Sources	RES	01	--	02	03	--	--	--	--	--	50	50
TOTAL			--	**10**	--	**04**	**14**	**09**	**240**	**60**	**--**	**--**	**100**	**400**

Level: 3

Total Courses : 05
Total Credits : 14
Total Marks : 400

Assessment of PR / OR / TW:

1) All orals & practicals are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING
PROGRAMME STRUCTURE
LEVEL - 4
APPLIED TECHNOLOGY COURSES

Sr. No.	Course Code	Course Title	Course Abbr	PRQ	TEACHING SCHEME				EXAMINATION SCHEME						
					TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
									Hrs	Mark					
01	6410	Professional Practice	PPR	--	--	--	04	04	--	--	--	--	--	50	50
02	6411	Seminar	SEM	--	--	--	02	02	--	--	--	--	--	50	50
03	6412	Project	PRO	100 CR	--	--	04	04	--	--	--	--	50	50*	100
04	6441	Applied Electronics	AET	--	04	--	04	08	03	80	20	25	--	25	150
05	6442	Audio Video Engineering	AVE	--	03	--	02	05	03	80	20	--	25	--	125
06	6443	Digital Communication	DCO	--	03	--	02	05	03	80	20	--	25	25	150
07	6444	Advance Communication Systems	ACS	--	03	--	02	05	03	80	20	--	25	25	150
08	6445	.NET Technology	NTT	--	01	--	04	05	--	--	--	--	--	50	50
TOTAL			--	--	**14**	**--**	**24**	**38**	**12**	**320**	**80**	**25**	**125**	**275**	**825**

Level: 4

Total Courses : 08
Total Credits : 38
Total Marks : 825

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING
PROGRAMME STRUCTURE
LEVEL - 5
DIVERSIFIED COURSES

Sr. No.	Course Code	Course Title	Course Abbr	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6552	Microcontroller-8051	MIC	04	--	04	08	03	80	20	25	--	25	150
02	6553	Control System and PLC	CSP	03	--	02	05	03	80	20	--	--	25	125
03	6554	Computer Hardware and Networking	CHN	04	--	02	06	03	80	20	--	25	50	175
Elective III: Any **ONE** of the following														
04	6555	Data Communication and Networking	DCM	04	--	02	06	03	80	20	--	25	25	150
	6556	Advanced Microcontrollers	AMC	04	--	02	06	03	80	20	--	25	25	150
	6557	Process Control and SCADA System	PCS	04	--	02	06	03	80	20	--	25	25	150
Elective IV: Any **ONE** of the following														
05	6558	Mobile Communication	MCM	04	--	02	06	03	80	20	--	25	25	150
	6559	Embedded System	EMS	04	--	02	06	03	80	20	--	25	25	150
	6560	Mechatronics: Components and Systems	MCS	04	--	02	06	03	80	20	--	25	25	150
Elective V : Any **ONE** of the following														
06	6561	Antenna and Microwaves	AMW	04	--	02	06	03	80	20	--	25	25	150
	6562	VLSI Techniques	VLT	04	--	02	06	03	80	20	--	25	25	150
	6563	Industrial Automation	IAM	04	--	02	06	03	80	20	--	25	25	150
TOTAL			--	**23**	**--**	**14**	**37**	**18**	**480**	**120**	**25**	**100**	**175**	**900**

Level: 5

Total Courses : 06
Total Credits : 37
Total Marks : 900

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING
COURSES FOR AWARD OF CLASS

Sr. No.	Course Code	Course Title	Course Abbr	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6248	Linear Integrated Circuits	LIC	04	--	04	08	03	80	20	25	--	25	150
02	6249	Analog Communication	ACO	04	--	02	06	03	80	20	25	--	25	150
03	6250	Industrial Electronics and Applications	IEA	04	--	04	08	03	80	20	25	--	25	150
04	6411	Seminar	SEM	--	--	02	02	--	--	--	--	--	50	50
05	6412	Project	PRO	--	--	04	04	--	--	--	--	50	50*	100
06	6442	Audio Video Engineering	AVE	03	--	02	05	03	80	20	--	25	--	125
07	6443	Digital Communication	DCO	03	--	02	05	03	80	20	--	25	25	150
08	6552	Microcontroller-8051	MIC	04	--	04	08	03	80	20	25	--	25	150
09	6553	Control System and PLC	CSP	03	--	02	05	03	80	20	--	--	25	125
Any **ONE** from **Elective III-**														
10	6555	Data Communication and Networking	DCM	04	--	02	06	03	80	20	--	25	25	150
	6556	Advanced Microcontrollers	AMC	04	--	02	06	03	80	20	--	25	25	150
	6557	Process Control and SCADA System	PCS	04	--	02	06	03	80	20	--	25	25	150
Any **ONE** from **Elective IV-**														
11	6558	Mobile Communication	MCM	04	--	02	06	03	80	20	--	25	25	150
	6559	Embedded System	EMS	04	--	02	06	03	80	20	--	25	25	150
	6560	Mechatronics: Components and Systems	MCS	04	--	02	06	03	80	20	--	25	25	150
Any **ONE** from **Elective V-**														
12	6561	Antenna and Microwaves	AMW	04	--	02	06	03	80	20	--	25	25	150
	6562	VLSI Techniques	VLT	04	--	02	06	03	80	20	--	25	25	150
	6563	Industrial Automation	IAM	04	--	02	06	03	80	20	--	25	25	150
TOTAL			--	**37**	--	**32**	**69**	**30**	**800**	**200**	**100**	**175**	**325**	**1600**

Total Courses : 12
Total Credits : 69
Total Marks : 1600

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN ELECTRONICS & TELECOMMUNICATION ENGINEERING
SAMPLE PATH
ENTRY LEVEL- 10+

Nature of Course	First Year		Second Year		Third Year		Total
	Odd Term	Even Term	Odd Term	Even Term	Odd Term	Even Term	
Compulsory	6101(05) CMS	6104(04) EMT	6244(08) BTX	6246(06) INI	6250(08) IEA	6412(04) PRO	
	6102(03) DLS	6106(06) CHY	6245(05) EMN	6248(08) LIC	6303(03) IOM	6443(05) DCO	
	6103(04) BMT	6107(06) EGR	6247(08) DEX	6301(03) AMT	6410(04) PPR	6444(05) ACS	
	6105(06) PHY	6113(06) FET	6249(06) ACO	6441(08) AET	6411(02) SEM	6445(05) NTT	
	6114(04) EWP	6115(03) COA	6251(05) CPG	6554(06) CHN	6442(05) AVE	6553(05) CSP	
	6127(04) EWS	6116(06) EMC			6552(08) MIC		
		6302(02) EVS					
Total credits (Compulsory)	**26**	**33**	**32**	**31**	**30**	**24**	**176**
Elective	--	--	I) Any **ONE** from **Elective: I**: 6305(SSL), 6306(MKM) : **(03)**	I) Any **ONE** from **Elective: II**: 6309(EDP), 6310(RES) : **(03)**	I) Any **ONE** from **Elective: III:** 6555(DCM), 6556(AMC), 6557(PCS) **:(06)**	Any **ONE** from **each** I) **Elective: IV**: 6558(MCM), 6559(EMS), 6560(MCS) II) **Elective: V:** 6561(AMW), 6562(VLT), 6563(IAM) : **(06+06=12)**	
Total Credits (Elective)	**--**	**--**	**03**	**03**	**06**	**12**	**24**
Total Courses	**06**	**07**	**06**	**06**	**07**	**07**	**39**
Total Credits (Compulsory + Elective)	**26**	**33**	**35**	**34**	**36**	**36**	**200**
Grand Total of Credits							**200**

Note : Figures in bracket indicates total credits.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE / DD / ID
COURSE : Communication Skills (CMS) **COURSE CODE** : 6101

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

Proficiency in English is one of the basic needs of technical students hence this curriculum aims at developing the functional and communicative abilities of the students. As Communication skills play a decisive role in the career development and entrepreneurship this course will guide and direct to develop a good personality and effective communication too. This course is compiled with an aim of shaping minds of engineering students while catering to their needs.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand & use basic concepts of Communication in an organisation and social context.
2. Use reasonably and grammatically correct English language with reading competency.
3. Utilise the skills to be a competent communicator.
4. Develop comprehension skills, improve vocabulary and acquire writing skills.
5. Overcome language and communication barriers with the help of effective communication techniques.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply the process and identify types of Communication for being an effective communicator
2. Identify the barriers in the communication process and apply ways to overcome them
3. Interpret graphical information precisely
4. Use formal written skills for business correspondence.
5. Exhibit listening & reading skills for improving competencies in communication.
6. Pronounce English sounds with correct stress and intonation in day to day conversations.
7. Construct correct grammatical sentences in oral and written communication.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Communication**	1a. Define communication & objectives 1b. Describe the process of Communication 1c. Differentiate between types of communication	1.1 Meaning of communication: definition, objectives and Importance of communication 1.2 Elements/Process of communication 1.3 Types of communication: Formal, Informal, Verbal, Nonverbal, vertical, Horizontal, Diagonal	04
Unit-II	2a. Explain types of barriers	2.1 Barriers to Communication a) Physical Barrier	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Communication Barriers.	2b. Describe the principles of effective communication 2c. Discuss ways to overcome barriers. 2d. Identify various barriers	• Environmental(time, noise, distance and surroundings) • Personal(deafness, stammering, ill-health, spastic, bad handwriting, temporary physical disabilities) b) Mechanical: Machines/means oriented c) Psychological: Day dreaming prejudice, emotional, blocked mind, generation gap, status, inactiveness, perception d) Language: Difference in language, technical jargons pronunciation and allusion 2.2 Ways to overcome barriers 2.3 Principles of effective communication	
Unit-III **Nonverbal & Graphical Communication**	3a. Explain use of body language in oral conversations 3b. Label and interpret the graphical information correctly 3c. Describe the importance of graphical and nonverbal methods in technical field.	3.1 Non-verbal codes: • Proxemics • Chronemics • Artefacts 3.2 Aspects of body language(Kinesics) 3.3 Graphical communication • Advantages and disadvantages of graphical communication • Tabulation of data and its depiction in the form of bar graphs and pie charts.	06
Unit-IV **Formal Written Communication**	4a. Develop notices, circulars and emails 4b. Draft letters on given topics 4c. Prepare technical reports. 4d. Develop various types of paragraphs.	4.1 Office Drafting :Notice, Memo, Circulars and e-mails 4.2 Job application and resume 4.3 Business correspondence: Enquiry, Reply to an enquiry order, complaint, adjustment, 4.4 Technical Report Writing: Accident report, Fall in Production / survey, progress Investigation / maintenance 4.5 Paragraph writing -Types of paragraphs • Descriptive • Technical • Expository	12
Unit-V **Listening skills**	5a. Differentiate between hearing and listening. 5b. Apply techniques of effective listening.	5.1 Listening versus hearing 5.2 Merits of good listening 5.3 Types of listening 5.4 Techniques of effective listening	02
Unit-VI **Reading Skills**	6a. Describe various methods to develop	6.1 Reading for comprehension 6.2 Reading styles 6.3 Developing vocabulary	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	vocabulary 6b. Develop reading competencies. 6c. Explain steps to comprehend passage	6.4 Methods of word formation: prefixes, suffixes, collocations, synonyms, antonyms, Homophones, Homonyms. 6.5 Comprehension of unseen passages	
Unit-VII **Speaking Skills**	7a. Demonstrate Correct Pronunciation, stress and intonation in everyday conversation 7b. Develop formal conversational techniques. 7c. Deliver different types of speech	7.1 Correct Pronunciation -Introduction to sounds vowels, consonants, stress, intonation 7.2 Conversations : • Meeting & Parting • Introducing & influencing requests • Agreeing & disagreeing • Formal enquiries 7.3 Speech-Types of speech • Welcome Speech • Farewell speech • Vote of thanks	06
Unit-VIII **Language Grammar**	8a. Use grammatically correct sentence in day to day oral and written communication 8b. Distinguish between determiners & apply correctly in communicative use 8c. Use correct verb for given course. 8d. Use appropriate preposition as per time, place and direction. 8e. Transform the sentences.	8.1 Tense • Present Tense(Simple, Continuous, perfect, perfect Continuous) • Past Tense(Simple, Continuous, perfect, perfect Continuous) • Future Tense(Simple) 8.2 Determiners • Articles (A, An, The) • Some, Any, Much, Many, All, Both, Few, A few, The few, Little, A little, The little, Each, Every. 8.3 Modal Auxiliaries Can, Could, May, Might, Shall, Should, Will, Would, Must, Have to, Need, ought to 8.4 Sentence Transformation • Voice • Degree • Affirmative, Negative, Assertive, 8.5 Prepositions • Time • Place • Direction 8.6 Conjunctions	08
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Communication	--	02	04	06
II	Communication Barriers	02	02	02	06
III	Nonverbal & Graphical communication	--	02	08	10
IV	Formal Written Communication	--	04	18	22
V	Listening Skills	--	--	04	04
VI	Reading Skills	--	02	06	08
VII	Speaking Skills	02	02	04	08
VIII	Language Grammar	**--**	04	12	16
	TOTAL	**04**	**18**	**58**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Communicate on the given topic/situation.	02
2	II	Identify communication barriers	02
3	III	Non-verbal communication	02
4	IV	Business letter writing &job application	02
5	IV	Draft official letter	02
6	IV	Technical report writing on given topic	04
7	V	Attend a seminar and preparing notes	02
8	VI	Vocabulary building with different methods	02
9	VII	Language lab Experiment for correct pronunciation of sounds	04
10	VII	Write & present conversations on given situations	02
11	VIII	Grammar application-various exercises on grammar	04
12	I to VIII	Mini project (on given topic)	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare charts on types of communication.
2. Convert language information in graphical or nonverbal codes.
3. Maintaining own dictionary of difficult words, words often confuse, homophones & homonyms.
4. Listening daily English news on television or radio & to summarise it in their language.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Use audios of correct pronunciations.
2. Show videos about use of body language in oral formal conversations

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Effective English Communication	Krishna Mohan and Meenakshi Raman	Tata McGraw Hill Publishing Co. Ltd.
2	English for practical purpose	Z. N. Patil	Macmillan
3	Spoken English	Basal and Harrison	Orient Longman
4	Contemporary English Grammar	R. C. Jain, David Green	Macmillan
5	Business correspondence and Report writing	R. C. Sharma and Krishna Mohan	Tata McGraw Hill Publishing
6	English Communication for Polytechnics	S. Chandrashekhar & others	Orient Black Swan
7	Active English Dictionary	S. Chandrashekhar & others	Longman

B) Software/Learning Websites

1. http://www.communicationskills.co.in
2. http://www.mindtools.com
3. http://www.communication.skills4confidence
4. http://www.goodcommunication skills.net
5. http://www.free-english-study.com/
6. http://www.english-online.org.uk/
7. http://www.englishclub.com
8. http://www.learnenglish.de
9. http://www.talkenglish.com/
10. http://www.englishgrammarsecrets.com
11. http://www.myenglishpages.com/
12. http://www.effective-business-letters.com/
13. http://www.englishlistening.com/
14. http://www.class-central.com

C) Major Equipments/ Instruments with Broad Specifications

1. Digital English Language Laboratory.
2. Computers for language laboratory software
3. Headphones with microphone

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1									H		M
CO2									H		M
CO3	M								H		M
CO4		M							H		M
CO5	M								H		M
CO6		M							H		
CO7	M								H		M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL /AE / DD / ID
COURSE : Development of Life Skills (DLS) **COURSE CODE :** 6102

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	---	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

This course will develop the student as an effective member of the team in the organization. It will develop the abilities and skills to perform at highest degree of quality. It enhances his/her capabilities in the field of searching, assimilating information, handling people effectively and solving challenging problems.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop the abilities and skills to perform at highest degree of quality as an individual as well as a member of core group or team.
2. Enhance capabilities in the field of searching, assimilating information, managing the given task, handling people effectively and solving challenging problems.
3. Understand and use personal management techniques.
4. Analyse their strengths, weaknesses, opportunities and threats.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Analyse self attitude and behaviour.
2. Acquire self learning techniques by using various information sources
3. Identify personal strengths to get future opportunities.
4. Develop presentation skills with the help of effective use of body language.
5. Enhance leadership traits and recognise the importance of team work.
6. Face interview without fear
7. Resolve conflict and solve problems by appropriate methods.
8. Set the goal for personal development.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Self Analysis**	1a. Explain types of Motivation. 1b. Differentiate between types of attitude. 1c. Describe types of behaviour 1d. Analyse SWOT of an individual	1.1 Motivation-types, need 1.2 Attitude-types, tips for developing positive attitude 1.3 Behaviour-types-passive, assertive, aggressive 1.4 Confidence building-need, importance 1.5 SWOT analysis-(significance)	02
Unit-II **Self Learning Techniques**	2a. Explain the self learning techniques by enhancing memory and	2.1 Need & importance of SLT 2.2 Information source-Primary, secondary, tertiary 2.3 Enhancing Memory and concentration	02

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
(SLT)	concentration 2b. Apply practical skills for effective learning 2c. Identify the information sources	2.4 Learning Practical Skills- need of Practical Skills types of practical skills-technical, organisational, human Domains of learning 1)cognitive 2)Affective 3)psychomotor 2.5 information search techniques-library search, internet search	
Unit-III **Self Development & management**	3a. Explain the Need of self Management 3b. Set the goals for personal development	3.1 Stress management-remedies to avoid, minimize stress 3.2 Health management –importance of Diet & exercise 3.3 Time management-time planning, tips for effective time management 3.4 Goal setting-need and importance 3.5 Creativity	03
Unit-IV **Emotions**	4a. Explain nature and types of human emotions 4b. Differentiate between cognitive and emotional intelligence	4.1 Basic emotions- 4.2 Emotional intelligence 4.3 Emotional stability/maturity.	01
Unit-V **Presentation skills**	5a. Develop presentation skills with the help of body language 5b. Describe utilisation of voice quality in oral conversations	5.1 Body Language – Codes, dress and appearance, postures, gestures Facial expressions 5.2 Voice and language 5.3 Use of aids:-OHP, LCD projector, white board	02
Unit-VI **Group discussion and interview techniques**	6a. Participate in group discussion 6b. Face interview without fear.	6.1 introduction to group discussion 6.2 ways to carry group discussion 6.3 Parameters-analytical, logical thinking, Decision making 6.4 Interview techniques Necessity, tips for handling common questions	02
Unit-VII **Team work**	7a. Recognise the importance of team work 7b. Enhance leadership qualities	7.1 stages of team development 7.2 Understand and work with dynamic group 7.3 Ingredients of effective teams. 7.4 leadership in teams, handling frustration in group	02
Unit-VIII **Conflicts & Problem Solving**	8a. Describe sources of conflicts and resolve conflicts 8b. Develop lateral thinking abilities 8c. Identify innovative methods in solving Problems.	8.1 sources of conflict 8.2 Resolution of conflict 8.3 ways to enhance interpersonal relation 8.4 Steps in problem solving 8.5 Problem solving techniques-trial, error & brainstorming	02
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Self Introduction-giving personal details for introducing self	02
2	II	SLT-Access the book on biography of scientist/industrialist/invention from the library or internet	02
3	I	Deliver a seminar for 10 minutes using presentation aids.	02
4	IV	Prepare PowerPoint slides on given topic and make presentation	02
5	VII	Case study for problem solving in an organisation	04
6	V	Discuss a topic in a group & prepare minutes of discussion.	02
7	VI	Prepare questionnaire for your friend or any person in the organisation to check emotional intelligence.	02
8	VII	Goal setting for achieving the success-SMART goal.	02
9.	I	SWOT Analysis for yourself with respect to your Strength, Weakness, Opportunities & Threats	04
10	III	Attend a seminar or a guest lecture and note down the important points and prepare a report of the same.	02
11	VIII	Undertake any social activity in a team and prepare a report about it(i.e. tree plantation, blood donation, environment protection, rain water harvesting)	04
12	III	Management of self-stress management, time management, health management	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Preparing personal time table.
2. Performing YOGA as a routine part of daily life.
3. Practicing breathing exercises.
4. Improving concentration by chanting and meditation.
5. Focusing on behavior skills and mannerism
6. Searching information on internet and newspapers.
7. Concentrating on various aspects of personality development.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Use of videos on personality development.
2. Use of power point presentation on health, time & stress management
3. Case study of an organization
4. Use of videos to show interviews of successful personalities.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Make Every Minute Count	Marion E Haynes	Kogan Page India
2	Body language	Allen Pease	Sudha Publication Pvt. Ltd.
3	Presentation Skills	Michael Hatton	ISTE New Delhi
4	Organizational Behavior	Pearson Education Asia	Tata McGraw Hill
5	Working in Teams	Chakravarty, Ajanta	Orient Longman
6	Develop Your Assertiveness	Bishop, Sue	Kogan Page India
7	Adams Time Management	Marshall Cooks	Viva Books
8	Time Management	Chakravarty, Ajanta	Rupa and Company
9	Target setting & Goal Achievement	Richard hale, Peter whilom	Kogan page India
10	Creativity &problem solving	Lowe and Phil	Kogan page (I)P Ltd
11	Basic Managerial Skills for all	E. H. Mc Grah, S. J.	Prentice Hall of India, Pvt. Ltd.

B) Software/Learning Websites

1. http://www.mindtools.com
2. http://www.successconsciousness.com
3. http://www.studyhabits.com
4. http://www.motivateus.com
5. http://www.quickmba.com
6. http://www.success77.com
7. http://www.stress.org
8. http://www.topachievement.com
9. http://www.ethics.com
10. http://www.creativityforlife.com
11. http:// www.motivation.com
12. http://www.queendom.com

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	L	M			L		L	M	H		H
CO2	M	M			L	L	H		M		H
CO3					M		M	M	H		H
CO4	L	L			L	M	M		H		M
CO5					L		M	M	H	M	L
CO6		L			L	M			H		M
CO7	L				M	M	L	M	M	L	L
CO8	L	L			L	M	L	L	H		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Basic Mathematics (BMT) **COURSE CODE** : 6103

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	01	--	04	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

This course is classified under foundation course and intends to teach the students basic facts, concepts and principles of Mathematics, as a tool to analyse the engineering problems and lay down the understanding of basic technology courses.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Acquire the knowledge of mathematical terms definitions, principles and procedure of algebra, trigonometry and co-ordinate geometry.
2. Develop the process of logical thinking.
3. Comprehend the principles of the other courses.
4. Solve problems by using analytical & systematic approach.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply logarithm concept for solving mathematical problems
2. Solve determinant and matrix
3. Solve simultaneous equation in three variables
4. Use partial fraction to solve engineering problems
5. Apply binomial theorem to solve engineering problems
6. Determine properties of triangle and solution of triangle
7. Use coordinate geometry for solving problems in straight lines and circles

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Logarithm**	1a. Define logarithm use it for conversion 1b. Apply laws of logarithm to solving problems 1c. Identify common logarithm and Naperian logarithm	1.1 Concept and definition of Logarithm, conversion of exponential and logarithmic forms 1.2 Laws of logarithms and change of base formula 1.3 Common logarithm and **Naperian** logarithm definition and **notation only.**	03
Unit-II **Determinant and Matrix Algebra**	2a. Calculate determinant of order two and three and apply Cramer's Rule. 2b. Calculate area Of Triangle & condition of	2.1 Determinant of order two and three, Cramer's Rule for Three Variables. Area of Triangle and Condition of Co linearity. 2.2 Definition of a matrix, types of matrix, algebra of matrices, equality of	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	co linearity 2c. Define various types of matrices; solve problems using Algebra of matrix. 2d. Calculate Inverse of matrix	matrices, scalar multiplication, product of two matrices, Transpose of matrix. 2.3 Minor, cofactor and ad joint of matrix, Inverse of matrix by ad Joint matrix method.	
Unit-III **Partial Fraction**	3a. Identify proper & improper 3b. Resolve partial fraction method of Case I, Case II and Case III.	3.1 Rational function, proper and Improper rational Functions 3.2 Concept of partial fraction. Case-1 The denominator contains linear non repeated factors. Case-2 the denominator contains linear but repeated factors Case-3 the denominator contains quadratic irreducible factors	05
Unit-IV **Binomial Theorem**	4a. State Binomial Theorem for Positive integral Index. 4b. Use T_{R+1} for finding middle term general term 4c. Use approximation Theorem for solving problems	4.1 Binomial Theorem for positive integral index, formula for Tr+1, Middle term, particular term. 4.2 Binomial Theorem for rational and negative index (expansion up to four terms only), approximation theorem, simple problems	04
Unit-V **Measurement of Angle**	5a. Conversion of sexagesimal systems & circular systems	5.1 Measurement of angles, sexagesimal systems & circular systems, co-terminal angles, positive and negative angles, conversion of angle to radian to degree and degree to radians.	02
Unit-VI **Trigonometric Ratios**	6a. Calculate trigonometric ratios of any angle, Solve problem using fundamental Identities. 6b. Solving problem using allied, Compound, Multiple and Sub multiple forms.	6.1 Trigonometric ratios of any angle, graph of trigonometric functions fundamental identities 6.2 Trigonometric ratios of allied, compound, multiple and sub multiple angles, sum &product forms.	08
Unit-VII **Inverse Trigonometric Functions**	7a. Convert & solving inverse trigonometry function 7b. Use of $\tan^{-1} x + \tan^{-1} y$ form to solve problem.	7.1 Concept and definition of trig. Function, Relation between inverse trig. functions	02
Unit-VIII **Properties Of Angle and Solution of Triangle**	8a. Use properties of triangle : Sine rule, Cosine rule to solve mathematical problems 8b. Solve any triangle problems	8.1 Sine rule, cosine rule & law of tangent (simple problems) 8.2 solutions of triangle	04
Unit-IX	9a. Calculate Slope, X and Y, intercept Use	9.1 Slope and intercepts of straight line, various form of straight line, angle	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Equation of Straight Line	various form of Straight line to solve problems.	between two lines, condition for two parallel or perpendicular lines, perpendicular distance formula, distance between two parallel lines.	
Unit-X **Equation of Circle**	10a. Calculate Radius & Centre of general circle 10b. Apply various form of circle 10c. Calculate Equation of tangent & normal to the circle.	10.1 Equation of standard circle, center radius form, general form of circle, diameter form of circle, equation of tangent and normal to the circle.	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS

Unit No.	Unit Title	Distribution of Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Logarithm	02	02	02	06
II	Determinant And Matrix Algebra	04	08	04	16
III	Partial Fraction	02	04	02	08
IV	Binomial Theorem	02	02	02	06
V	Measurement Of Angle	02	02	--	04
VI	Trigonometric Ratios	04	04	04	12
VII	Inverse Trigonometric Function	02	02	--	04
VIII	Properties of Triangle And Solution Of Triangle	02	02	04	08
IX	Equation Of Straight Line	02	04	04	10
X	Equation Of Circle	02	02	02	06
	TOTAL	**24**	**32**	**24**	**80**

6.0 ASSIGNMENTS/ TUTORIAL /TASKS

Sr. No.	Unit No.	Batch wise Tutorial Exercises **Tutorial:** Ten question of multiple choice with justification	Approx. Hrs. required
1	I	Logarithm	01
2	II	Determinant	01
3	II	Matrix Algebra	02
4	III	Partial Fraction	01
5	IV	Binomial Theorem	02
6	V	Measurement And Angle	01
7	VI	Trigonometric Ratios	01
8	VI	Trigonometric Ratios	01
9	VII	Inverse Trigonometric Ratios	02
10	VIII	Properties of Triangle And Solution Of Triangle	01
11	IX	Straight Line	02
12	X	Circle	01
		TOTAL	**16**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Teacher guided self learning activities.
2. Applications to solve identified Engineering problems and use of Internet.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not applicable

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Mathematics for polytechnic student (I)	S. P. Deshpande	Pune Vidyarthi Gruha
2	Trigonometry	S. L. Loney	S. Chand
3	Higher Engineering Mathematics	B. S. Grewal	Khanna
4	College Algebra	F.G. Valles	Charter Publication.
5	Higher Algebra	H. S. Halls & S.R. Night	
6	Matrices	F. Ayers	Schan Series. Metric Edition Book, Palace of India.

B) Software/Learning Websites

1. http://www.mathsisfun.com
2. http://mathinsight.org/logarithm_basics
3. http://www.mathportal.org/linear-algebra/determinants/determinant-of-a-matrix.php
4. http://www.math.hmc.edu/calculus/tutorials/matrixalgebra/
5. http://ibgwww.colorado.edu/~carey/p7291dir/handouts/matrix.algebra.pdf
6. http://www.purplemath.com/modules/binomial2.htm
7. http://www.themathpage.com/atrig/line.htm
8. http://i1.dainikbhaskar.com/web2images/education/maths_13659_13897.pdf
9. http://mathworld.wolfram.com/InverseTrigonometricFunctions.html
10. http://aieee.examcrazy.com/maths/formula-tips/Co-ordinate-Geometry-circle.asp

C) Major Equipments/ Instruments with Broad Specifications

1. Scientific Calculator
2. Computer system with Printer and Internet system.
3. LCD Projector

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		M								L
CO2	H		M								L
CO3	H		L								L
CO4	H		L								L
CO5	H		M								L
CO6	H		M								L
CO7	H		M								L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Engineering Mathematics (EMT) **COURSE CODE** : 6104

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	01	--	04	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

The study of mathematics is necessary to develop in the students the skills essential new for the disciplines like Genetic Engineering, Biotechnology and Information Technology etc. This course is extension of Basic Mathematics and stepping to learn applied mathematics. Engineering mathematics lays down the foundation to understand and express principles and laws involved in other technology courses.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Acquire knowledge of differential calculus, vector algebra, statistics and probability, complex numbers.
2. Develop the ability to apply mathematical methods to solve engineering problem
3. Acquire sufficient mathematical techniques necessary for daily and practical problems.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes :

1. Solve function and limit of function
2. Apply derivatives to solve engineering problems
3. Apply vector to solve engineering problems
4. Determine statistics probability to solve engineering problems
5. Solve engineering problems using complex number

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Function**	1a. Solve problem of functions, State even & odd function, identify various types of function.	1.1 Definition of function, types of functions, Basic functions such as algebraic, exponential, logarithmic, trigonometric, inverse trigonometric functions, explicit, implicit, composite, inverse, parametric, exponential even & odd functions, simple problems	03
Unit-II **Limits**	2a. Apply limit of various types of Functions.	2.1 Definition of limit, limit of Functions such as algebraic Functions, trigonometric functions, logarithm and exponential functions	05
Unit-III **Derivatives**	3a. Solve problems of derivative with the help of rules & formulae of derivative.	3.1 Concept and definition of derivative, Notation, standard Formulae and rules of derivative 3.2 Methods of differentiation, derivative of	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	3b. Differentiate various types of functions 3c. Calculate second order of derivative.	composite functions, implicit function. Parametric function. Inverse function. Logarithmic Differentiation. 3.3 Second order derivatives, simple problems.	
Unit-IV **Application of Derivatives**	4a. Apply geometrical meaning of derivative; solve the problem based on related rates, radius of curvature & maxima minima.	4.1 Geometric meaning of derivative 4.2 Error theorem. 4.3 Related rates, radius of curvature 4.4 Maxima & Minima	06
Unit-V **Vectors**	5a. Apply algebra of vector 5b. Calculate scalar and vector products 5c. Apply vector algebra to find work done and moment of force, Area of parallelogram	5.1 Definition of vector, position vector, algebra of vector (equality, addition, subtraction and scalar multiplication) 5.2 Dot (scalar) and vector (cross) product of two vectors. 5.3 Application of vectors, work done and moment of force about a point and line.	08
Unit-VI **Statistics & Probability**	6a. Calculate range, mean deviation, standard deviation for group and ungrouped data, coefficient of variance 6b. Apply the theory of probability to solve problem 6c. Apply addition and multiplication theorems	6.1 Measure of dispersion such as range, mean deviation, standard deviation, variation and coefficient of variation. 6.2 Definition of random experiment, sample space event, occurrence of events and types of events (impossible, mutually exclusive, exhaustive and equally likely) 6.3 Definition of probability, addition and multiplication theorems of probability.	08
Unit-VII **Complex Number**	7a. Solve problem based on complex number(real and imaginary part, polar form) 7b. Apply Algebra of complex number to solve problem 7c. Solve problem of Euler's function & circular function, Hyperbolic function.	7.1 Definition of complex number, Cartesian, polar and exponential forms of complex number. 7.2 Algebra of complex no. (equality, addition, subtraction multiplication and division) 7.3 De–Moiver's theorem (without proof) and simple problems. 7.4 Euler's form of circular functions, Hyperbolic functions and relation between them.	08
TOTAL			**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS:

Unit No.	Unit Title	Distribution of Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Function	02	02	--	04
II	Limits	02	04	02	08
III	Derivative	06	08	06	20
IV	Application Of Derivative	02	04	06	12
V	Vector	04	06	02	12
VI	Statistics and Probability	04	04	04	12
VII	Complex Number	04	04	04	12
	TOTAL	**24**	**32**	**24**	**80**

6.0 ASSIGNMENTS/TUTORIAL/TASKS:

Sr. No.	Unit No.	**Batch wise Tutorial Exercises** (Outcomes in Psychomotor Domain) **Tutorial:** Ten question of multiple choice with justification	Approx. Hrs. required
1	I	Function	01
2	II	Limits I	01
3	II	Limits II	01
4	III	Derivative I	01
5	III	Derivative II	01
6	III	Derivative III	02
7	III	Second Order Derivative	01
8	IV	Application Of Derivative	02
9	V	Vector	02
10	VI	Statistics	01
11	VI	Probability	01
12	VII	Complex Number	02
		TOTAL	**16**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Teacher guided self learning activities.
2. Applications to solve identified Engineering problems and use of Internet.
3. Learn graphical software: Excel, DPlot and Graph.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Mathematics for polytechnic student (II)	S. P. Deshpande	Pune Vidyarthi Gruha
2	Higher Engineering Mathematics	B. S. Grewal	Khanna
3	Advanced Engineering Mathematics	H.K. Das	Khanna Publication
4	Calculus of single variable	R.T. Smith	Tata McGraw Hill.
5	Engineering Mathematics	S.S. Shastri	Prentice Hall Publication

B) Software/Learning Websites

1. http://schools.aglasem.com/1341
2. http://www.emathzone.com/tutorials/calculus/types-of-functions.html
3. http://www.mathsisfun.com/algebra/vectors.html

4. http://www.mathsisfun.com/data/
5. http://mathworld.wolfram.com/ComplexNumber.html

C) Major Equipments/ Instruments with Broad Specifications

1. Scientific Calculator
2. Computer system with Printer and Internet system.
3. LCD Projector.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		M								L
CO2	H		M								L
CO3	H		M								L
CO4	H		M								L
CO5	H		M								L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Applied Physics (PHY) **COURSE CODE :** 6105

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	Online Exam Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	02	Max.	80#	20#	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

 # Indicates online examination

1.0 RATIONALE:

Physics is associated with our lives at every stage. A good scientific attitude is essential for every human being to increase his/her quality of life. Today learning Physics has become more challenging because it is no more a watertight compartment. The approach is now inter-disciplinary and integrated with emphasis on the principle with their application.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand and apply the laws of Physics in various contexts.
2. Apply their knowledge of basic Physics to solve problems and present the solution in a clear and concise manner.
3. Acquire and develop experimental skills including the use of variety of laboratory instruments, taking of data for interpretation and its analysis.
4. Develop skill in the presentation of clear and concise written accounts of laboratory work.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Differentiate between various systems of measurement and identify proper unit of a physical quantity.
2. Identify the properties of Laser and Optical fibre as well as their engineering applications.
3. Acquire the knowledge about superconductors, indoor lighting.
4. Identify conductors & insulators of heat and analyse the relation between pressure, volume and temperature of gas.
5. Recognise elastic properties of materials and types of modulus of elasticity.
6. Identify the properties such as surface tension of liquids and viscosity of fluids.
7. Be aware of the propagation of sound and acoustics of building.
8. Distinguish between various effects produced by an electric charge.
9. Gain broad ideas about capacitors, semiconductors and p-n junction diode.
10. Discover the basics and applications of photoelectric cell and X rays.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Units & Measurements**	1a. Differentiate between fundamental &derived quantities/units.	1.1 Need of measurements, units of measurements, systems of units, SI units, fundamental & derived units, fundamental & derived quantities.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1b. Determine dimension of a physical quantity. 1c. Calculate different types of errors in measurements. 1d. Illustrate use of vernier caliper and screw gauge for linear measurements.	1.2 Dimension of physical quantity, dimensional analysis & its uses, order of magnitude & significant figures. 1.3 Accuracy & errors, instrumental, systematic and random error, estimation of error-average value, absolute error, relative error & percentage error, numerical. 1.4 Measuring instruments-vernier caliper and micrometer screw gauge.	
Unit-II **Light**	2a. Calculate refractive index of material of prism. 2b. Identify advantages of optical fibre over conducting wire. 2c. Differentiate between types of optical fibre. 2d. Recognise the principle of photometry. 2e. Acquire knowledge about indoor lighting.	2.1 Refraction of light, refractive index and its significance, Refraction through prism, Derivation of Prism formula. 2.2 Total internal reflection of light (TIR), Optical fibre, advantages and disadvantages, construction of optical fibre. 2.3 Transmission characteristics of Optical, fibre, types of optical fibre-step & graded index fibre, Application of optical fibre. 2.4 Luminous flux, luminous intensity, illumination, candela, lumen, illuminance, inverse square law of illuminance, principle of photometry. 2.5 Indoor lighting-direct, indirect, semi-indirect, utilization factor, efficiency of source, maintenance factor, space to height ratio, total luminous flux, numericals.	08
Unit-III **Laser**	3a. Describe the principle of laser. 3b. Acquire knowledge about He-Ne laser 3c. Identify applications of holography	3.1 Laser, Properties of laser, spontaneous absorption, spontaneous emission and stimulated emission, population inversion, pumping, life time, meta-stable-state. 3.2 Construction, advantages & disadvantages of Helium-Neon Laser, applications of Laser. 3.3 Holography recording and Reconstruction of hologram, Application of holography.	06
Unit-IV **Current Electricity**	4a. Demonstrate ohm's law, use of metre bridge to find resistance. 4b. Use potentiometer to find internal resistance. 4c. Identify positive/	4.1 Ohm's law, Specific resistance, conductance, conductivity, Wheatstone's network, balancing condition, metre bridge. 4.2 Theory of shunt, fall of potential along wire, potentiometer. 4.3 Effect of temperature on resistance of metals, semiconductors &	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	Negative temperature coefficient of resistance of material. 4d. Calculate electrical energy consumed in kWh. 4e. Distinguish between properties of conductor & superconductor.	insulators, temperature coefficient of resistance, positive& negative temperature coefficient of resistance. 4.4 Heating effect of electric current, electric power, electric energy, kilowatt hour. 4.5 Superconductivity, graph of temperature versus resistance for mercury, superconductors, properties and application of superconductors, Numericals.	
Unit-V **Transfer of Heat & Gas Laws**	5a. Illustrate conversion of temperature. 5b. Distinguish between good & bad conductors of heat on the basis of thermal conductivity. 5c. Calculate coefficients of expansion of solids. 5d. Identify the relation between pressure, volume & temperature of gas. 5e. Gain idea about specific heats of gases. 5f. Distinguish between isothermal, adiabatic, isobaric & isochoric process.	5.1 Temperature & heat, Celsius & Fahrenheit scale, conduction, convection, radiation. 5.2 Conduction of heat –variable state, steady state and temperature gradient, law of thermal conductivity, coefficient of thermal conductivity, applications of thermal conductivity. 5.3 Expansion of solids, Coefficient of linear, areal and cubical expansion and relation between them. 5.4 Statement of Boyle's law, Charle's law, Gay Lussac's law, concept of absolute zero, Kelvin scale of temperature. 5.5 General gas equation, universal gas constant, Work done in expanding a gas at constant pressure, specific heats of a gases and relation between them (equation only). 5.6 Isothermal, isobaric and isochoric and adiabatic process, difference between these processes, numericals.	08
Unit-VI **(ONLY For CE / ME / PS / AE)** **Elasticity**	6a. Differentiate between elasticity, plasticity & rigidity 6b. Calculate moduli of elasticity of materials. 6c. Illustrate applications of elasticity.	6.1 Deforming force, restoring force, elasticity, plasticity and rigidity. 6.2 Stress and strain with their types, elastic limit, Hooke's law, moduli of elasticity (Y, η, K) and their significance, Poisson's ratio. 6.3 Stress-strain diagram for wire under increasing load, factor of safety, applications of elasticity, Numericals.	06
Unit-VII **(ONLY For CE / ME / PS / AE)** **Surface**	7a. Acquire knowledge about surface tension of liquids & its effects. 7b. Recognise effects of impurities & temperature on	7.1 Cohesive and adhesive force, range of molecular forces, sphere of influence, surface energy, Surface tension, molecular theory of surface tension. 7.2 Effect impurities and temperature on	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Tension	surface tension of liquid. 7c. Calculate surface tension of liquid.	surface tension, relation between surface tension & surface energy 7.3 Angle of contact, capillary action relation between surface tension, capillary rise, radius of capillary, application of surface tension, numericals.	
Unit-VIII **(ONLY For CE / ME / PS / AE)** **Viscosity**	8a. Identify applications of Pascal's law. 8b. Gain knowledge about viscosity of fluids. 8c. Find viscosity of fluids using Stoke's law 8d. Distinguish between types of flow of fluid. 8e. Identify significance of Reynold's number.	8.1 Pressure, pressure due to liquid column, hydrostatic paradox, Pascal's law and its applications. 8.2 Viscosity, velocity gradient, Newton's law of viscosity, coefficient of viscosity and its unit. 8.3 Stoke's law, expression for relation between coefficient of viscosity and terminal velocity. 8.4 Types of flow, Streamline and turbulent flow, advantages of streamline flow. 8.5 Critical velocity, Reynold's number and its significance, Bernoulli's principle & its applications, application of viscosity, Numericals.	06
Unit-IX **(ONLY For CE / ME / PS / AE)** **Sound and Acoustic**	9a. Recognise frequency of audible & other sound waves. 9b. Calculate sound intensity in decibel scale. 9c. Illustrate properties & applications of Ultrasonic waves. 9d. Calculate reverberation time using Sabine formula. 9e. Plan acoustical planning of a hall.	9.1 Introduction to sound, frequency of sound and limits of Audibility, intensity of sound. 9.2 Reflection of sound, absorption coefficient, transmission coefficient, reflection coefficient, Loudness and intensity level, threshold of hearing & pain, Decibel scale. 9.3 Ultrasonic waves-properties & applications. 9.4 Echo, Reverberation, standard reverberation time, Sabine's formula. 9.5 Condition for good Acoustics, factors affecting acoustical planning of auditorium. Numericals.	08
Unit-VI **(only for EE / IF / CM / EL)** **Electrostatics**	6a. Calculate force between two charges using Coulomb's law. 6b. Illustrate different properties of electric lines of force. 6c. Calculate electric potential due an electric charge. 6d. Identify importance of potential of earth.	6.1 Coulomb's inverse square law, permittivity of medium, unit charge, electric field, electric field intensity. 6.2 Electric lines of force and their properties, electric flux, Electric flux density and relation between them, Electric flux associated with charge. 6.3 Electric potential, potential difference, potential gradient, dielectric strength, breakdown potential, expression for PD between two points due to point charge, expression for absolute potential at point.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		6.4 Potential due to charged sphere. (three cases), potential of earth, numericals.	
Unit-VII **(only for EE / IF / CM / EL)** **Capacitance**	7a. Illustrate charging &discharging of capacitor. 7b. Calculate effective capacitance of combination of capacitors. 7c. Identify types of capacitors. 7d. Calculate energy stored by a capacitor.	7.1 Capacitor, Capacitance and its unit, dielectric, effect of dielectric, dielectric constant, dielectric breakdown, Principle of capacitor. 7.2 Charging and discharging of Capacitor, Capacitor in series and parallel. 7.3 Types of capacitor- fixed & variable. 7.4 Expression for capacitance of parallel plate capacitor, capacitance of spherical and cylindrical capacitor equation only, energy stored by charged capacitor (equation only), numericals.	06
Unit-VIII **(only for EE / IF / CM / EL)** **Photo Electricity and X-rays**	8a. Acquire knowledge about photoelectric effect. 8b. Identify characteristics of Photoelectric effect. 8c. Calculate KE of photoelectrons using Einstein's equation. 8d. Recognise production of X-rays. 8e. Illustrate properties & applications of x- rays.	8.1 Planck's quantum theory, Photo electric effect, experiment to study photoelectric effect. 8.2 Characteristics of photoelectric effect, threshold frequency, threshold-wavelength, photoelectric work function, stopping potential. 8.3 Einstein's photoelectric equation, photoelectric Cell and types, applications of photoelectric cell. 8.4 Origin of X-rays, production of X-rays using Coolidge's X-ray tube, minimum wavelength of X-ray. 8.5 Properties of X-rays, applications of X- rays, numericals.	06
Unit-IX **(only for EE / IF / CM / EL)** **Band Theory of Solids**	9a. Classify solids on the basis of band theory. 9b. Classify Semiconductors. 9c. Illustrate forward & reverse bias of P-N Junction diode.	9.1 Energy bands in solids-valence band, conduction band and forbidden energy gap, classification of solids on the basis of band theory : conductor, insulator and semiconductor. 9.2 Properties of semiconductor, classification of semiconductors intrinsic & extrinsic, P type & N type semiconductors. 9.3 P-N junction diode, forward & reverse bias characteristics of P-N junction diode, advantages of semiconductor devices.	06
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
Units common for all programmes					
I	Units and measurements	04	02	04	10
II	Light	02	04	04	10
III	Laser	02	04	02	08
IV	**Current electricity**	02	04	04	10
V	**Transfer of heat & gas laws**	02	04	04	10
Units ONLY FOR CE/ME/PS/AE					
VI	**Elasticity**	02	04	02	08
VII	Surface tension	02	04	02	08
VII	Viscosity	02	02	04	08
IX	Sound and Acoustics	02	02	04	08
Units ONLY FOR EE/IF/CM/EL					
VI	Electrostatics	02	04	02	08
VII	Capacitance	02	04	02	08
VIII	Photo electricity & X-rays	02	02	04	08
IX	Band theory of solids	02	02	04	08
	TOTAL	**20**	**30**	**30**	**80**

Legends: R = Remembrance (Knowledge); U= Understanding; A= Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
		Common practicals	
1	I	Measure the dimensions of different objects using Vernier caliper	02
2	I	Measure the dimensions of different objects using micrometer screw gauge	02
3	II	Determine the refractive index of material of prism using spectrometer	02
4	IV	Verify ohm's law and determine resistivity of material of given wire.	02
5	IV	Verify law of resistance in series & parallel using metre bridge.	02
6	V	Determine coefficient of linear expansion using Pullinger's apparatus.	02
7	V	Verify Boyle's law	04
8	IV	Verify principle of potentiometer.	02
		Practicals for CE/ME/PS/AE	0
1	VI	Verify Hooke's law of elasticity and determine Young's modulus of	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
		material of wire using Searle's apparatus.	
2	VII	Determine surface tension of water using capillary rise method.	02
3	VIII	Verify Stoke's law of viscosity and determine coefficient of viscosity of given fluid.	04
4	IX	Determine coefficient of absorption of sound of given acoustical material.	04
		Practicals for EE/IF/CM/EL	
1	VII	Verify law of capacitance in series/parallel.	02
2	VII	Charging & discharging of capacitor and determine its time constant.	04
3	VIII	To study I-V characteristic of photoelectric cell.	04
4	IX	To study I-V characteristics of PN junction diode in forward/reverse biased condition.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare charts of Vernier caliper, screw gauge, travelling microscope, Spherometer & spectrometer for lab demonstration.
2. Study acoustical planning of institute's auditorium hall.
3. Study lighting system of institute's conference hall.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show videos based on topics in the curriculum (total internal reflection, population inversion, different laws of physics) for better understanding of the concepts.
2. Show videos of practical demonstration before performance of practical for better understanding of practical.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Engineering Physics	R K Gaur & S L Gupta	Dhanpat Rai Pub.
2	Applied Physics	Prof. Arthur Beiser	Tata McGraw hill Pub.
3	Engineering Physics	D K Bhattacharya	Oxford University press
4	Physics	Halliday & Resnick	Wiley India

B) Software/Learning Websites

1. www.physicsclassroom.com
2. www.physics.org
3. www.physics.brown.edu
4. http://scienceworld.wolfram.com/physics/
5. http://hyperphysics.phy-astr.gsu.edu/hbase
6. www.msu.edu/~brechtjo/physics
7. http://www.rp-photonics.com/laser_applications.html
8. http://webphysics.davidson.edu/alumni/jimn/He-Ne/Pages/Theory.htm
9. http://physix_jun.tripod.com/fibres_4.htm
10. http://www.suite101.com/content/optics-total-internal-reflection-a51310
11. http://teachers.web.cern.Ch/teachers/archive/HST2001/accelerators/superconductivity/superconductivity.htm
12. http://en.wikipedia.org/wiki/Acoustics

C) Major Equipments/ Instruments with Broad Specifications

1. Vernier Caliper (LC = 0.02mm)
2. Micrometer screw gauge (LC = 0.01mm)
3. Aneroid barometer
4. Digital stop watch
5. Travelling Microscope
6. Regulated power supply
7. Apparatus to verify Boyles law
8. Stoke's App to measure viscosity
9. Metre bridge
10. Searle's apparatus for Young's modulus
11. Pullinger's apparatus
12. Gas burner with regulator, LPG gas cylinder and lighter
13. Spectrometer
14. Bunsen's photometer.
15. Ammeter, voltmeter, galvanometer, rheostat, resistance box
16. Potentiometer.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		M	M	L			H	L		L
CO2	H		M	L	L			M	L		
CO3	H		M	L	L			M			
CO4	H	M	M	L	M	L		M			L
CO5	H	M	M	L	M			M			
CO6	H	M	L	L	M			M			
CO7	H		L	L	M	L		M	L		L
CO8	H		M	L	M			L	L		
CO9	H		M	L	M			M	L		
CO10	H		L	L	M	L		L	L		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Applied Chemistry (CHY) **COURSE CODE** : 6106

TEACHING & EXAMINATION SCHEME

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	Online Exam. Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	02	Max.	80#	20#	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

 # indicates online examination

1.0 RATIONALE:

Chemistry is the basic science course which is essential to all engineering programmes. The basic aim of teaching science is to develop in the students the habit of scientific inquiry, ability to establish the cause and effect. The study of basic concepts of chemistry like atomic structure, water treatment, metals and alloys, corrosion, lubricants, non metallic materials, fuels, environmental effects etc. will help the students to understand engineering courses where the emphasis is laid on the application of these concepts. Teaching of chemistry should be aimed at developing the right type of aptitude in the students and the ability to predict the result under given conditions.

Thus good foundation in basic science will help the students in their self development to cope up with continuous flow of innovation.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop scientific attitude in students.
2. Apply knowledge of chemistry in engineering situations.
3. Develop in students the habit of scientific enquiry, ability to establish cause and effect.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply the principles of chemistry to engineering situations.
2. Apply knowledge to correlate the properties of materials, their engineering uses and protection.
3. Write electronic configuration of various elements.
4. Apply various applications of electrolysis in engineering situations.
5. Illustrate various methods of softening of hard water.
6. Use the appropriate metals and alloys for different engineering applications.
7. Differentiate various types of corrosion and gain knowledge on control measures associated with corrosion
8. Select lubricants for machines.
9. Enlist the various characteristics of good fuel.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
Unit-I **Atomic Structure**	1a. Describe structure of an atom 1b. Explain Bohr's theory and distinguish between orbit and orbital	1.1 Structure of an atom, fundamental particles of an atom, concept of atomic number, mass number. 1.2 Bohr's theory, orbit, orbital, shapes of orbital, energy level, sub energy level	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
	1c. Describe rules for arrangement of electrons 1d. Give electronic configuration 1e. Describe the different types of compounds 1f. Explain the formation of various electrovalent and covalent compounds	1.3 Hund's rule, Aufbau principle, Rules for distribution of electrons in shell and subshells. 1.4 Electronic configuration of atoms having atomic number 1-30 1.5 Electrovalent and covalent compounds, electrovalency and covalency 1.6 Formation of covalent compound e.g. H_2O, CH_4, O_2, N_2, C_2H_2 1.7 Formation of electrovalent compound e.g. NaCl, $CaCl_2$, $AlCl_3$	
Unit-II **Electro chemistry**	2a. Explain basic concepts of electrochemistry. 2b. Explain theory of ionization and factors affecting it 2c. Explain mechanism of electrolysis with examples. 2d. Describe faraday's first and second laws and solve numerical. 2e. Explain the applications of electrolysis 2f. Describe the construction and working of cells	2.1 Definition of electrochemistry, atom, ion, electrode, cell, electrolysis, electrolytes, non-electrolytes, anode, cathode. 2.2 Arrhenius theory of ionization, degree of ionization, factors affecting degree of ionization. 2.3 Electrolysis, mechanism, electrolysis of fused NaCl, aqueous NaCl using platinum electrode, $CuSO_4$ solution using Copper electrode. 2.4 Faraday's first and second law, 2.5 Numericals on Faraday's laws. 2.6 Process of electroplating and electro refining 2.7 Types of cell- e.g. Dry cell, Ni-Cd cell, introduction to solar cell	08
Unit-III **Water**	3a. Explain sources, impurities, properties of water. 3b. Differentiate between hard and soft water 3c. Describe the ill effect of hard water in domestic and industrial field 3d. Explain the different methods for removal of hardness of water. 3e. Describe the different treatments of drinking water 3f. Explain the concept of pH and pOH numerical related with it, applications of pH in engineering.	3.1 Sources of water- Rain, surface, underground water. Impurities in water- suspended, colloidal, dissolved, biological 3.2 Physical and chemical properties of water. 3.3 Hard and soft water. Types of hardness of water, Salts producing hardness of water, Units of hardness of water. 3.4 Domestic field- cooking, washing, bathing, drinking. Industrial field- paper, textile, dye, sugar industry. 3.5 Temporary hardness- boiling, Clark's method. 3.6 Permanent hardness- Permutit's method, ion exchange method. 3.7 Methods of purification of water: Screening, Sedimentation, coagulation, filtration, Sterilization of water. 3.8 Definition of pH and pOH, pH scale and numerical.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
		3.9 Applications of pH in engineering. -city water supply, corrosion, effluent treatment, electroplating.	
Unit-IV **Metals**	4a. Explain the basic concepts of metallurgy. 4b. Describe different characteristics of metal. 4c. Explain the metallurgy of iron. 4d. Describe the physical properties and applications of metals.	4.1 Definition of ore, mineral, gangue 4.2 Hardness, toughness, brittleness, tensile strength, malleability, ductility, machinability, weldability 4.3 Flow sheet of metallurgy 4.4 Steps of metallurgy : a. Concentration: physical, chemical. b. Reduction: smelting, alumino thermic process. c. Refining: poling, liquation, distillation, electrorefining. 4.5 Physical properties and applications of Fe, Cu, Al, Cr, Ni, Sn, P	08
Unit-V **Alloys**	5a. Describe the meaning of alloy, its preparation and its purposes of formation. 5b. Explain the classification of alloys and their applications	5.1 Definition of alloy, different methods of preparation of alloy, 5.2 Purposes of formation of an alloy. 5.3 Classification of alloys • Ferrous alloy- alloys steel and its applications. • Non ferrous alloy-Copper alloy-brass, bronze, gun metal, Monel metal Aluminium alloy-Duralumin • Solder alloy and its types.	06
Unit-VI **Corrosion**	6a. Describe magnitude of corrosion, meaning of corrosion, types of corrosion 6b. Explain the factors affecting the atmospheric and immersed corrosion 6c. Explain different methods of protection of metal from corrosion	6.1 Magnitude of corrosion, definition of corrosion, types of corrosion- a) Atmospheric corrosion- definition, types – b) corrosion due to oxygen, mechanism of corrosion due to oxygen, nature of film and its role in corrosion process c) Corrosion due to other gases 6.2 Immersed corrosion- definition, it's mechanism, galvanic and concentration cell corrosion 6.3 Factors affecting atmospheric and immersed corrosion 6.4 Methods of protection of metal from corrosion- hot dipping, metal spraying, sherardizing, electroplating of metal cladding, organic coating-paints and varnish	10
Unit-VII **Lubricants**	7a. Describe lubricants, its function and classification of lubricants. 7b. Explain lubrication and it's types	7.1 Definition of lubricant, function of lubricants, classification of lubricants. 7.2 Definition of lubrication, types of lubrication 7.3 Physical properties- viscosity, viscosity index, oiliness, flash and fire point,	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
	7c. Describe physical and chemical properties of lubricants 7d. Explain selection of lubricants for various machines	volatility, cloud and pour point. 7.4 Chemical properties- acid value, saponification value, emulsification. 7.5 Properties and names of lubricants used for various machines like delicate instruments, heavy load and low speed machine, gears, cutting tools, I.C. Engine, steam engine	
Unit-VIII **Fuels**	8a. Describe fuels, characteristics of good fuel, types of fuel 8b. Describe solid fuel-e.g. coal in detail 8c. Describe liquid fuel e.g. -petroleum 8d. Describe gaseous fuel their advantages 8e. Distinguish between solid liquid and gaseous fuels	8.1 Definition of fuel, characteristics of good fuel, classification of fuel 8.2 Solid fuel-e.g. coal, it's types, properties of good coal, selection of coal, analysis of coal, determination of C and H in coal 8.3 Liquid fuel-e.g. petrol, classification of petrol, refining of petrol 8.4 Gaseous fuel e.g. LPG, natural gas, biogas 8.5 Advantages of gaseous fuel over solid and liquid fuels 8.6 Comparison between solid, liquid and gaseous fuels	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No	Unit title	Distribution of Theory marks			
		R level	U level	A level	Total
1	Atomic Structure	04	02	02	08
2	Electrochemistry	04	04	04	12
3	Water	04	04	04	12
4	Metals	04	02	04	10
5	Alloys	02	02	02	06
6	Corrosion	04	02	06	12
7	Lubricants	04	02	04	10
8	Fuels	04	02	04	10
	TOTAL	**30**	**20**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1 to 5	I	Inorganic qualitative analysis of any five solutions	10
6	II	Determination of electrochemical equivalent of copper.	02
7 to 8	III	Strength of given acidic solution using standard base solution.	04
9	III	Determination of pH of different unknown solutions.	02
10	III	Determination of chloride content in given water sample.	02
11 to 12	III	Determination of hardness of water	04
13	V	Determination of % of Fe in given ferrous alloy sample.	02
14	VI	To find relation between decrease in weight due to corrosion of metal and time.	02
15	VII	Determination of viscosity of given lubricating oil.	02
16	VIII	Determination of % of moisture in given coal sample by proximate analysis.	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Draw structures and write electronic configurations of atoms having atomic number 1-30.
2. Testing of water samples.
3. Sampling and collection of coal.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. CAI package, video demonstration, charts, models, visits and expert seminar/lecture.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons
2	A Text Book of Polytechnic Chemistry	V. P. Mehta	Jain Brothers
3	Engineering Chemistry	S. S. Dara	S. Chand Publication
4	Industrial Chemistry	B. K. Sharma	Goel Publication
5	Environmental Chemistry & Pollution control	S. S. Dara	S. Chand Publication
6	Engineering Chemistry	M. M. Uppal	Khanna Publisher New Delhi

B) Software/Learning Websites

1. http://chemistry.osu.edu/~woodward/ch121/ch2_atoms.htm
2. http://www.nyu.edu/pages/mathmol/textbook/atoms.html
3. www.chemguide.co.uk/atoms/properties/gcse.html
4. http://www.water-research.net/index.php/water-treatment/tools/hard-water-hardness
5. http://www.unitedutilities.com/documents/WaterhardnessFactSheet.pdf
6. http://www.explainthatstuff.com/alloys.html
7. http://www.gordonengland.co.uk/xcorrosion.htm
8. http://cuiet.info/notes/chemistry/Lubricants.pdf
9. http://www.ignou.ac.in/upload/unit-3.pdf

C) Major Equipments/ Instruments with Broad Specifications

1. Muffle furnace
2. Distillation Plant
3. Computer lab with 20 Computers for online theory exam.
4. Digital pH meter
5. Ostwald's viscometer
6. Electronic weighing balance (0 to 100gm capacity).
7. Digital Stop watch.
8. Lovi Bond comparator
9. Regulated DC power supply
10. Rheostat
11. Ammeter

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	M	M		L			L			L
CO2	H		M	M	L						L
CO3	H			M							L
CO4	H			M							L
CO5	H	M	L		M			L			
CO6	H	M		M	M						L
CO7	H			M	M						L
CO8	H			M	M						L
CO9	H										L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / EE / IF / CM / EL / AE
COURSE : Engineering Graphics (EGR) **COURSE CODE** : 6107

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
02	--	04	06	--	Max.	--	--	--	25	--	25	50
					Min.	--	--	--	10	--	10	--

1.0 RATIONALE:

Engineering Graphics is the language of engineers. The concepts of Engineering Graphics are used to develop & express the ideas and convey the instructions, which are used to carry out jobs in the Engineering field. This preliminary course aims at building a foundation for the further course in drawing and other allied courses.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the use of drawing tools and equipments.
2. Understand the significance of engineering curves for various applications.
3. Understand the projections of point and line inclined to one reference plane.
4. Interpret the pictorial view and understand orthographic projection of the simple object.
5. Interpret the orthographic projection and understand pictorial view of the simple object.
6. Understand the significance of sectional view in the drawing.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Draw the engineering curves for given engineering applications.
2. Draw the projections of point and lines inclined to one reference plane only.
3. Draw and dimension orthographic projections of given object.
4. Interpret orthographic projections of object and draw isometric view.
5. Draw sectional view of simple objects as per IS convention.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Drawing Instruments and their Uses**	1a. Use Instruments for drawing, Scales, Lines, & their applications.	1.1 Letters and numbers (single stroke vertical) 1.2 Convention of lines and their applications. 1.3 I.S. codes for planning and layout. 1.4 Scale (reduced, enlarged & full size) plain scale and diagonal scale. 1.5 Sheet layout. 1.6 Geometrical constructions and drawing polygons	04
Unit-II **Engineering Curves**	2a. Draw Conic curves, involutes, Cycloid. 2b. State the applications of engineering curves.	2.1 Methods for drawing an ellipse concentric circle, directrix focus and arc of circle method. 2.2 Methods for drawing parabola by directrix focus and rectangular method.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		2.3 Methods for drawing a hyperbola by directrix focus and rectangular method. 2.4 Procedure for drawing involutes of circle and polygon (up to hexagon) 2.5 Procedure for drawing cycloid, epicycloid and hypocycloid	
Unit-III **Projections of Point and Line**	3a. Draw the projection of point 3b. Draw projection of line	3.1 Projection of point in the different quadrants. 3.2 Projection of line parallel to one plane and inclined to another reference plane only.	04
Unit-IV **Orthographic Projections**	4a. Interpret & draw orthographic views from given pictorial view.	4.1 Concept of Orthographic projections. 4.2 Conversion of pictorial view into Orthographic views only first angle projection method for simple objects.	06
Unit-V **Isometric Projections**	5a. Interpretation of isometric view. 5b. Draw isometric view from given orthographic views	5.1 Use of Isometric scale. 5.2 Comparison of true scale with isometric scale 5.3 Conversion of orthographic views into isometric View / projection	06
Unit-VI **Sectional View**	6a. Draw sectional view of simple drawing	6.1 Representation of sectional plane 6.2 Conversion of orthographic views into sectional View	04
		TOTAL	**32**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (Theory)

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Two sheet on letters, numbers and representation of lines and redraw the figures.	08
2	II	Sheet on six engineering curves	12
3	III	Sheet on projections of line. (04 problems)	12
4	IV	Sheet on orthographic projection.(02 problems)	12
5	V	Sheet on isometric views and projection. (04 problems)	12
6	VI	Sheet on sectional view. (02 problems)	08
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect the information about application of engineering curves.
2. Sketch the orthographic views of simple engineering product in sketch book.
3. Sketch isometric view of simple engineering product in sketch book.
4. Sketch sectional view of simple engineering product in sketch book.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Three Dimensional models of different objects.
2. Use software's, CAI packages for better imagination.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Engineering Drawing	N. D. Bhatt	Charotar Publishing House
2	Engineering Drawing	P. J. Shaha	S. Chand
3	Engineering Drawing and Graphics	K. Venugopal	New Age International

B) Software/Learning Websites

1. AutoCAD
2. Solid works.

C) Major Equipments/ Instruments with Broad Specifications

Not applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	H	H								L
CO2	H	H									
CO3	H	M	M	M					L		L
CO4	H	M	M	M					L		
CO5	H	M		H							

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in IF / CM / EL
COURSE : Fundamentals of Electrical Technology (FET) **COURSE CODE** : 6113

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

This course is introduced in the curriculum of Information technology, Computer technology and Electronics & Telecommunication Engineering to understand basic principles of electric devices & circuits & also to understand the operations of electrical drives. Student can apply knowledge to solve the electrical problems in their field.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand basics of electrical power.
2. Know various laws of AC and DC circuits.
3. Derive various terms of related to electrical circuits and machines
4. Understand construction, working and applications of various types of motor.
5. Describe need and circuit operations of UPS and stabilizers
6. Understand safety precautions while working with electrical installations
7. Understand Battery construction and maintenance
8. Understand wiring system for installations.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply basic terms and laws of electricity to understand an electric circuit operation.
2. Identify and state type of induced emf.
3. Derive and calculate various electrical parameters related to electrical circuit.
4. Explain transformer working principle and calculate its parameter.
5. Identify applications of DC motor and stepper motor.
6. State various single phase induction motor, know its applications
7. Compare Online and Offline state of UPS and know specification of batteries.
8. List various component with specifications used for electrical installation
9. Practise safety precaution while working with electrical installation.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fundamentals of Electricity**	1a. State Ohm's law 1b. Define various terms of electricity 1c. Solve series and parallel resistive network. 1d. Understand and apply Kirchhoff's laws 1e. Describe temperature coefficient of resistance 1f. State definitions of work, power and energy and its SI	1.1 Electrical potential, current resistance, ohm's law 1.2 Electrical circuits, series & parallel resistance, current & voltage distribution, Kirchhoff's laws & its applications 1.3 Temperature coefficient of resistance 1.4 Work, power, energy, the SI units	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	units 1g. Apply various effect of electric current 1h. Apply various rules.	1.5 Effects of electric current – magnetic, chemical, heating effect. Fleming's rules, right hand gripping rule.	
Unit-II **Electromagnetic Induction**	2a. Describe and apply Faraday's law of Electromagnetic induction. 2b. Distinguish between static and dynamically induced emf 2c. Define self and mutually induced emf. 2d. State Lenz's law 2e. Explain and calculate energy stored in magnetic field.	2.1 Faraday's laws of electromagnetic induction Fleming's right hand rule 2.2 Static & dynamically induced emf, Lenz's law, self & mutual inductance. 2.3 Energy stored in magnetic field	06
Unit-III **AC Fundamentals**	3a. Differentiate between single phase and three phase AC supply 3b. Define terms related to alternating quantity. 3c. Differentiate between RMS and average values of alternating quantity. 3d. Elaborate concept of reactance and impedance &power factor. 3e. Solve simple numerical on AC circuit. 3f. Differentiate between Star and Delta network.	3.1 Single phase & three phase AC supply 3.2 Concept of Cycle, Time period, Frequency, amplitude, RMS & average values of an Alternating quantity 3.3 Voltage & current relationship for pure resistive, inductive & capacitive circuits [No derivation] 3.4 Concept of reactance impedance, power factor, simple AC circuits & simple numerical based on it. 3.5 Current, Voltage & Power relationship for balanced three phase star & delta connected systems.	10
Unit-IV **Single Phase Transformer**	4a. State Principle and function of the transformer 4b. Identify parts and types of transformer 4c. Derive emf and transformation ratio equation of transformer 4d. Describe various losses of transformer 4e. Calculate regulation and efficiency of transformer 4f. Explain Isolation and pulse transformer.	4.1 Single Phase Transformer: Function & principle of operation, construction, classification of transformer according to construction and Voltage level. 4.2 EMF equation, voltage ratio, turns ratio, Current ratio, kVA rating. (Simple numerical) 4.3 Regulation, losses in transformer, efficiency. (Simple numerical) 4.4 Isolation transformer and pulse transformer.	06
Unit-V **DC Motor**	5a. Explain constructional details of DC shunt motor. 5b. Describe working of DC shunt motor. 5c. Explain types and working of Stepper motor. 5d. Know applications of motors.	5.1 DC Shunt motor: Working principle, construction, operation, applications. 5.2 Stepper motor : types, working, applications	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-VI **Single Phase Induction motor**	6a. Enlist types of single phase induction motor 6b. Explain working of single phase induction motor 6c. Know applications of single phase induction motor.	6.1 Single phase induction motor: Construction, Classification, working and its applications	06
Unit-VII **UPS & stabilizers**	7a. Elaborate necessity of UPS 7b. Differentiate between online and offline UPS 7c. Draw block diagram of UPS 7d. Write function of each part of UPS 7e. Describe use and types of batteries used in UPS 7f. Define charging and discharging of batteries 7g. State meaning of Tickle charging 7h. Define Ampere hour capacity of battery, Specification of UPS. 7i. Elaborate maintenance need and schedule of batteries. 7j. Explain need of stabilizers 7k. Describe function of each part of stabilizers.	7.1 UPS: necessity of UPS for computers 7.2 Concept of on line and off line UPS 7.3 Block diagram of simple UPS, function of each block in short 7.4 Concept of cell/ battery, Types of batteries 7.5 Meaning of charging, discharging, & Tickle charging of battery. Ampere hours capacity of battery 7.6 Maintenance of lead acid cell 7.7 Specification related with UPS & their meaning. 7.8 Stabilizers (Servo): necessity of stabilizers for computers, block diagram, functions of each block.	07
Unit VIII **Electrical Wiring**	8a. Identify types of wires 8b. Explain types of wiring system used for computer room 8c. Differentiate between light and power circuit.	8.1 Electrical wiring: Types of wires, meaning of 1\18, 3\20, 7\20 wires, 8.2 Simple wiring system like casing capping, Conduit wiring. 8.3 Meaning of power & lighting circuits used in computer room by giving layout of wiring diagram of small computer room.	07
Unit-IX **Electrical Safety**	9a. Enlist types of fuses 9b. Describe Function of earthing, MCCB, ELCB 9c. Explain types of earthing 9d. Elaborate Safety precautions.	9.1 Necessity of Fuses, MCCB, ELCB, Types of fuses, 9.2 Necessity of Earthing, Earthing types, plate & pipe earthings. 9.3 Safety practices and Precautions to be taken while working with electrical installation.	06
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Fundamentals of Electricity	04	04	04	12
II	Electromagnetic induction	02	06	02	10
III	AC fundamentals	02	04	04	10
IV	Single phase transformer	02	04	02	08
V	DC Motor	02	04	02	08
VI	Single Phase Induction Motor	02	04	02	08
VII	UPS & stabilizers for computers	02	06	--	08
VIII	Electrical Wiring	02	06	--	08
IX	Electrical Safety	04	04	--	08
	TOTAL	**22**	**42**	**16**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Verification of ohm's law	02
2	I	Measurement of current & voltage in series resistive circuits.	02
3	I	Measurement of current & voltage in parallel resistive circuits.	02
4	I	Verification of Kirchhoff's current law and Kirchhoff's voltage law.	04
5	III	Verification of Resistance with temperature.	02
6	III	Verification of current & voltage relationships for. I) star connection II) Delta connection.	06
7	IV	Voltage & current ratio of a single phase transformer.	04
8	V	Demonstration and identification of D.C machines parts.	02
9	VII	Demonstration of different parts of UPS, servo stabilizers, write down specification of UPS & their meaning.	04
10	VIII	Demonstration of different types of wires, wiring systems, switches & accessories by visiting to computer laboratory in institute. (Report should be written on it)	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Study of Panel wiring for IT panels & racks by observation through visits.
2. Collect at least one example of electrical Equipment/ Machine representing types of induced emf.

3. Collect information of domestic appliances which driven by single phase induction motor.
4. Observe and enlist use of stepper motor in computer peripherals.
5. Measure gauge of electrical wire find its current carrying capacity.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Basics of electrical Engineering	V. N. Mittal	Tata McGraw Hill
2	Electrical Technology Vol. I &II	B.L. Theraja	S. Chand & Co.
3	Fundamentals of Electrical Engineering	M.N. Mittal	Everest Publishers House
4	A Course in Electrical & Electronic Measurement & Instrumentation	A.K. Sawhney	Tata McGraw Hill
5	Electrical Technology	Edward Hughes	E.L.B.S.

B) Software/Learning Websites

1. http://www.howstuffworks.com

C) Major Equipments/ Instruments with Broad Specifications

1. Three phase Auto transformer
2. Single Phase Transformer
3. Resistive load bank
4. Demo model of DC Machine
5. UPS

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		L								
CO2	H				L						
CO3			H	H							
CO4	H			H	L						
CO5	H				H						
CO6	H				L						
CO7		H			M	L					
CO8	H				M	L		H			
CO9			H					M		M	

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Electronic Workshop Practice (EWP) **COURSE CODE :** 6114

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

This course will help the students to have practical knowledge regarding various instruments, & will develop skills while handling tools, instruments, PCBS. It helps to know the basic procedure in designing any electronic circuit. Students will know how to assemble the circuits, test it & troubleshoot any problem if any.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Acquire basic skills of technician like testing, measurement etc.
2. Understand the functions of different active and passive components used in electronic circuits.
3. State the specifications of active and passive components
4. Assemble and troubleshoot simple electronic circuits.
5. Test self-built electronic circuits comprising of discrete electronic components**.**
6. Measure different electrical parameters.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify different active and passive components.
2. Read and interpret electronic circuit diagrams.
3. Assemble and test electronic circuits.
4. Troubleshoot electronic circuits.
5. Identify faulty component(s) in an electronic circuit.

4.0 COURSE DETAILS:

Unit	Major Practical Learning Outcomes (in psychomotor domain)	Topics and Sub-topics	Hours
Unit-I **Tools used in Electronic workshop**	1a. Selection and use of different tools. 1b. Identification of different tools. 1c. State the Specifications of tools.	1.1 Nose pliers, wire stripper, screw-Drivers, align keys, align screw, cutter, hand hacksaw, soldering iron, de-soldering pump, crimping tools and cable testers. 1.2 Identification, Selection and use of the tools.	04
Unit-II **Electronics Components**	2a. Draw Symbols & Identify different electronic components. 2b. Test different passive and active components. 2c. State the Specifications of electronics components. (Use of data book)	2.1 Identification and testing of passive and active components 2.2 Passive components: Resistor, Capacitor, Inductor 2.3 Active components: Diode, LED Bipolar Junction Transistor, Field Effect Transistor (FET), Uni junction Transistor (UJT), Silicon Controlled	12

Unit	Major Practical Learning Outcomes (in psychomotor domain)	Topics and Sub-topics	Hours
		Rectifier (SCR), DIAC, TRIAC, IC'S and SMD.	
Unit-III **Analog and Digital Meters**	3a. Draw front panel of analog and digital meters. 3b. Identify front panel controls of different analog and digital meters. 3c. Measurement of parameters using an analog and digital meter. 3d. List the specifications of an analog and digital meter. (Use of data book)	3.1 Need of Analog and Digital meters 3.2 Analog meters: Voltmeter and Ammeter. 3.3 Multimeter: Analog and digital multimeter. 3.4 Measurement of electrical parameters using an analog and digital multimeter.	12
Unit-IV **Electronic Equipments**	4a. Draw front panel controls of different electronics equipments 4b. Identify the front panel controls of electronic equipments. 4c. Measurement of parameters using measuring equipments. 4d. State the specifications of electronic equipments. (Use of data book / Manuals)	4.1 Need of electronic equipments. 4.2 Regulated power supply. 4.3 Cathode ray oscilloscope (CRO). 4.4 Function generator.	12
Unit-V **Cables, connectors and Switches.**	5a. Draw labelled diagrams of cables, connectors and switches. 5b. State use of cables, connectors and switches. 5c. State the Specifications of cables, connectors and Switches. (Use of data book)	5.1 Cable: Flat, Ribbon, Co-axial, twisted pair, Fiber optic cable. 5.2 Connector : PCB edge connector, FRC connector, D-type, BNC, TNC, MCB, RJ-45, RS-232, USB, Ethernet. 5.3 Switches: SPST, SPDT, Toggle, thumbwheel, rotary, slide, micro-switch, membrane.	12
Unit-VI **PCB Making & Mini Project**	6a. Use of Software for circuit and PCB artwork designing 6b. Select and draw electronic circuit of assigned mini-project 6c. Use of breadboard and general purpose PCB 6d. Identify the faults. 6e. Fabrication of PCB: etching, drilling, soldering and troubleshooting of circuit.	6.1 PCB: Types of PCB's- General purpose, Glass epoxy, paper phenolic, Single Sided, double Sided, Selection parameters and applications of PCB. 6.2 Drawing electronic circuit, Designing PCB layout and artwork, Screen printing, photo printing method, drilling, Mounting of components and soldering. 6.3 PCB Layout of Half wave, full wave rectifier and single stage CE amplifier using Express PCB software. 6.4 Build and test electronic circuit on PCB.	12
		TOTAL	**64**

5.0 SUGGESTED EXERCISES/PRACTICALS:

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Demonstration for identification and use of different tools. : Nose pliers, wire stripper, screwdrivers, align keys, align screw, cutter, soldering iron, de-soldering pump, crimping tools.	06
2	II	To identify and test passive components: Resistors, Capacitors and Inductors with color codes.	06
3	II	To identify and test Active components: Diodes, Transistors (BJT, FET, UJT), SCR, TRIAC, DIAC, IC'S and SMD'S.	06
4	III	To identify and measure AC &DC voltage and AC & DC current using analog Meters (Voltmeter and Ammeter)	04
5	III	To identify and measure the values resistance, voltage and current using analog and digital Multimeter.	04
6	IV	To State use of front panel controls of Regulated Power Supply and Identification of different circuits from Regulated power supply.	06
7	IV	To State use of front panel controls of Cathode Ray Oscilloscope and measure the Voltage and Frequency.	04
8	IV	To State use of front panel controls of Function Generator and measure the Voltage and Frequency at different waveforms.	04
9	V	To identify and test to demonstrate various types of cables and connectors and switches. A- Cables: Flat, Ribbon, Co-axial, Twisted pair, Fiber optic cable. B- Connectors: PCB edge connector, FRC connector, D-type, BNC, TNC, RJ-45, RS-232, USB connectors. C-Switches: SPST, SPDT, Toggle, thumbwheel, rotary, slide, Micro-switch, Membrane switch.	06
10	VI	Implement the simple electronic circuit using breadboard.	06
11	VI	Demonstration to draw circuit schematic, layout and artwork using one of the PCB making software mentioned below. (Express PCB, Free PCB, EAGLE PCB, workbench etc.)	06
12	VI	Mini-project Prepare PCB (layout, artwork designed by student) for assigned electronic circuits (Mini project group may consist of 3-4 students)	06
		TOTAL	**64**

6.0 SUGGESTED STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare specification table for electronic components and tools and write down the information about specifications, manufacturers and their cost.
2. Download data sheets of Diode, Transistors and ICs like 78xx, 79xx.
3. Prepare specification table for following measuring and testing equipments: CRO, Function generator and regulated power supply.
4. Assemble simple electronic circuit on breadboard.
5. Prepare layout and artwork of half and full wave rectifier circuits using PCB making software.

7.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show animation videos to demonstrate the working principles and constructional features of different types of electronics components and equipments,
2. Arrange expert lecture of an Industry Person/Trained Faculties in the area of core electronics.
3. Arrange an industrial visit to PCB Making/ assembling unit.

8.0 SUGGESTED LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Handbook of components for electronics	Harper Charles A	Laxmi Enterprise, Bombay
2	Electronic component Handbook	Thomas H. Jones	Reston publishing company
3	Electronic Materials & component	S. M. Dhir	Tata McGraw-Hill Education Pvt. Ltd; New Delhi
4	Printed Circuit Boards	Walter C. Bosshart	Tata McGraw-Hill Education Pvt. Ltd; New Delhi
5	Troubleshooting Electronic Equipment	R.S. Khandpur	Tata McGraw Hill Education Pvt. Ltd; New Delhi

B) Software/Learning Websites

1. http://www.alldatasheet.com
2. http://www.allelectronics.com
3. http://www.techniks.com
4. http://www.aplab.com
5. http://www.kpsec.freeuk.com

C) Major Equipments/ Instruments with Broad Specifications

1. Tools, Analog Voltmeters & Ammeters, Analog & Digital Multimeters.
2. Cathode Ray Oscilloscope
3. Regulated power Supply
4. Function generator.
5. Cable, connectors and switches
6. Breadboards
7. PCB making machineries and equipments
8. Deep coating machine, UV exposure unit
9. Etching machine.
10. Drilling machine, Shearing machine, developing negative and making PCB.

9.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	L		H	H	H	M					
CO2			H	H	H	H			M		
CO3			H	H	H	M					
CO4			H	H			H				M
CO5			H	H	H	H		M			

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Computer Applications (COA) **COURSE CODE :** 6115

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

It describes the facts, concept, principles and Techniques of computers. It describes the structure of computer and basic operations on computer as well as its peripherals. It focuses on the operating system used for a desktop computer. It describes application packages used in storing and use of information and office automation.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Use functions of hardware & software components of a computer system.
2. Use and handle the operating system as the interface to the computer system.
3. Set the parameter required for effective use of hardware combined with and application software's.
4. Use file managers, word processors, spreadsheets, presentation software's and Internet.
5. Use various applications of the Internet.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain a computer system and hardware and software components and operating system.
2. Explain system unit of computer
3. Explain and use MS-WORD.
4. Explain and use MS-EXCEL.
5. Explain and use MS-POWERPOINT.
6. Explain the concept of Internet

4.0 COURSE DETAILS:

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to Computer**	1a. Introduction of computers 1b. Types & Applications of computer 1c. Components of computer 1d. Introduction to Operating system	1.1 History of computers 1.2 Types Of Computer and Parts Of computer 1.3 Concept of hardware & Architecture of computer 1.4 Monitor, Mouse, Keyboard, Disk, CPU, Printer, Scanner, Modem, Video, Sound cards, Speakers. 1.5 Windows Operating System. 1.6 Concept of Windows-Arranging, Moving, Resizing, Opening and Closing of windows, Windows Explorer 1.7 Folder/ File Management-Search, copy, delete and rename files and folders, Windows Desktop 1.8 Windows Accessories: Notepad, Word Pad, Paint	02
Unit-II **System Unit**	2a. system unit 2b. Memory and microprocessor	2.1 Input unit, output unit, system unit-- Computer peripherals—motherboards. 2.2 Memory and its types, SMPS, connectors, Expansion Cards.	02
Unit-III **Word Processing Software - MS-WORD**	3a. Introduction to MS-word 3b. Menus of ms- Word 3c. basic operations of MS-Word 3d. introduction to Editors	3.1 Opening a document 3.2 Edit menu 3.3 Format Menu – Font, Paragraph, Bullets, Borders 3.4 Table formatting 3.5 Spell-check, mail-merge Inserting picture, word art, header footer 3.6 Printing document 3.7 Equation editor 3.8 Examples of Editors-Edit Plus. Turbo C editor	02
Unit-IV **Data Analysis Software - MS-Excel**	4a. Introduction to EXCEL. 4b. Use of worksheet 4c. Use of formula in Excel 4d. Basic of worksheet formatting	4.1 Basic worksheet skill. 4.2 Entering worksheet data. 4.3 Speed data entry. 4.4 Worksheet editing. 4.5 Auto correct worksheet 4.6 Cell editing. 4.7 Finding & replacing. 4.8 Inserting & Deleting cells, Rows & columns 4.9 Formulae. 4.10 Worksheet formatting. 4.11 Auto formatting worksheets. 4.12 Chart wizard 4.13 Conditional formatting	04
Unit-V **Presentations software - MS-Power Point**	5a. Introduction of power point 5b. Use the features of Power point 5c. creating slides	5.1 Creating new presentation 5.2 Slide, Slide sorter, Notes page views 5.3 Saving & printing the work 5.4 Using various slide Designs for single and multiple slides 5.5 Adding art. 5.6 Adding Custom animation & Slide Transition	04

Units	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		5.7 Editing individual slide 5.8 Updating text & text boxes 5.9 Action Buttons	
Unit-VI **Internet**	6a. Introduction of Internet 6b. Use of Internet 6c. Basic application of Internet 6d. study of browser and search engines	6.1 Concept: Network 6.2 Types of Networks-LAN, WAN, MAN 6.3 Internet basic terminology 6.4 Client, server concepts 6.5 Applications of Internet 6.6 Hardware & software requirements for internet connection 6.7 Various examples of Browsers 6.8 Browsing 6.9 Search Engines 6.10 Concept of E-Mail	02
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Legends: R = Remembrance (Knowledge); U= Understanding; A= Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
1	I	Understanding PC, Identify the front and components of CPU.	04
2	I	Understanding the storage devices.(Study various secondary storage devices along with their capacities)	04
3	I	Introduction to input and output devices and their connections(mouse, keyboard, monitor, printer)	04
4	II	Introduction to Window Operating System & its Accessories- Paint, Explorer, WordPad, Notepad etc.	04
5	III	Design a database using mail-merge in Ms-Word.	04
6	III	Implementation of features like auto correct, auto format, spells check, insert, table Handling etc in Ms-Word.	04
7	IV	Design a worksheet in MS- Excel for a Student Mark sheet.	04
8	IV	Implementation of Excel Features like conditional formatting, Form-wizard, Data, Filter, Validation, Sort all records etc.	04
9	V	Understanding the basics of presentation software & Creating a new presentation using advanced features of slide-show.	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
10	VI	Generate your Email-ID using Internet Service.	04
11	VI	Implementation of chatting service	04
12	VI	Study of browser	04
		TOTAL	**48**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Compare and use working of different types of operating systems.
2. Assemble one system

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Introduction to Computers	Peter Norton	Tata McGraw Hill
2	Computer Fundamentals Architecture	B. Ram	New Age International
3	Windows 7 Inside Out	Ed Bott Carl Siechert	Microsoft Press
4	Windows 7 or Windows XP For Dummies	Andy Rathbone	Wiley Publishing Inc
5	Structured computer Organization	Andrew S. Tanenbaum	Prentice Hall
6	Computer Fundamentals	V. Rajaraman	Prentice Hall

B) Software/Learning Websites

1. http://www.computerschool.NET/computer/index.html
2. http://www.introductiontocomputers.org/
3. http://www.functionx.Com/windows/index.htm
4. http://en.wikiversity.org/wiki/Introduction to Computer

C) Major Equipments/ Instruments with Broad Specifications

Hardware Intel Pentium Processor N3700 (2M Cache, up to 2.40 GHz), Windows 10 Home 64bit English, 2GB (1x2GB) 1600MHz DDR3L Memory, 500GB 5400 rpm Hard Drive, 19.5-inch HD+ (1600 x 900) Anti-Glare LED-Backlit Display, 2GB (1x2GB) 1600MHz DDR3L Memory, 500GB 5400 rpm Hard Drive, Intel HD Graphics, Tray load DVD Drive (RW to DVD/CD), **Ports Side** 2 USB 3.0 **Rear** 2 USB 2.0, 45 – RJ 10/100/1000 Gigabit, Wireless Keyboard and Mouse-KM636 - US International (QWERTY) – Black, Wireless mouse included with Keyboard

Software MS-Office 2010

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		H	H	H	H					
CO2	H		H	H	H	H					
CO3	H		H	H	H	H					
CO4	H		H	H	H	H					
CO5	H		H	H	H	H					
CO6	H		H	H	H	H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Electronic Material and Components (EMC) **COURSE CODE :** 6116

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

This course will help the students to acquire knowledge of Materials & components used in electronic systems. Also it will give details of construction, working principle of components & their practical applications.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know various electronic components and their applications.
2. Understand construction of various switches, relays and displays
3. Understand various types of cables, connectors and IC's used in electronic circuits.
4. Know about electronic components and materials from point of view of their manufacturing, operation and testing.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain constructional details, specification and applications of Electronic tools, materials and components
2. Identify and test passive and active components
3. Read data sheets of different components.
4. Explain construction and manufacturing technology of different IC.
5. Select different types of electronic materials and components for various applications.
6. Prepare artwork layout and PCB for assigned electronic circuit

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Resistors**	1a. Classify components. 1b. Classify resistors 1c. List specifications of resistors. 1d. Describe with sketch construction and working of different fixed and variable resistors	1.1 Components-(a)discrete and non discrete(b) active and passive (c)parasitic components 1.2 Concept of Resistors, Classification of resistors, Materials used for resistors 1.3 Resistors general specification: - maximum voltage rating, power rating, temperature coefficient, tolerance, Ohmic range, operating temperature 1.4 Colour Coding with four Color bands(simple numeral) 1.5 Classification of resistor:[A] Fixed resistor: Linear Resistors: Definition, types, construction and applications:	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Carbon Film, wire-wound resistor Nonlinear resistor: (a) LDR (b) TDR (c) VDR [B] Variable resistors: Construction and applications: Wire wound, potentiometer, Trimmer 1.6 Construction, working, applications and characteristic of LDR 1.7 Concept of linear and logarithmic potentiometer 1.8 Construction, specifications and applications of Linear Potentiometer-carbon, standard wire-wound, trimmer. 1.9 Difference between potentiometer and trimmer.	
Unit-II **Capacitors**	2a. Classify capacitors. 2b. List specifications of capacitors. 2c. Explain different fixed and variable capacitors with neat diagram 2d. List application of electrolytic capacitor.	2.1 Classification of capacitors, materials used for capacitors, dielectric materials. 2.2 Capacitors specification: capacitor working voltage, Insulation resistance, C/V ratio, power factor, capacitance-frequency characteristics, E.S.R. 2.3 Classification of capacitors: • Fixed capacitors. • Electrolytic capacitors: Construction and applications: (a) Aluminium (b) tantalum. • Non-electrolytic capacitors: Construction and applications: Disc, Ceramic, mica and paper capacitor 2.4 Variable capacitor: Construction and application: (a) Air-gang capacitor (b) PVC gang capacitor (c) Trimmer. Coding of capacitors-using numerals, color band system, directly printed on capacitors.	10
Unit-III **Inductors**	3a. Classify inductors 3b. Explain specifications of Inductors. 3c. Describe with sketch different inductors with their applications 3d. compare different inductors	3.1 Introduction to Magnetic Materials and types. 3.2 Faradays laws of Electromagnetic induction 3.3 Inductor Specifications- Definitions and expressions of self and mutual inductance, coefficient of coupling, Q-factor, inductive reactance. 3.4 Construction and applications of - Air core, iron core and ferrite core inductors 3.5 Construction, working and applications of slug tuned inductor 3.6 Colour coding of inductors	06
Unit-IV **Cables and Connectors**	4a. Explain various specifications of different cables and connectors 4b. Explain construction of different cables	4.1 General specifications of cables: characteristic impedance, current carrying capacity and flexibility. 4.2 Types of cables- construction and applications of coaxial, Twin core, optical fibre and FRC	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	and connectors with diagrams. 4c. List advantages and disadvantages of coaxial, twin core cables 4d. List applications of different connectors.	4.3 General specifications of connectors: contact resistance, breakdown voltage and insulation resistance 4.4 Constructional diagram and applications of: BNC, D-type, audio, video, printer, FRC and RJ-45 connectors.	
Unit-V **Switches, Relays and Displays**	5a. List different type of switches and relays. 5b. Draw and explain construction of different types of switches and relays. 5c. Explain construction of different types of relays 5d. Draw neat sketch of different type of switches and relays and displays.	5.1 Specifications: voltage rating, contact current rating, contact resistance and life. 5.2 Characteristics of switch and relay: operating time, release time, bounce time, electrical and mechanical life 5.3 Construction and applications of: Toggle, Rotary, Rocker, Slide, Thumb wheel and push to on and push to off switches. 5.4 Construction, working and applications of General purpose and Dry reed relays 5.5 Normally-Open (NO) and Normally-Closed (NC) contact 5.6 Comparison between switch and relay 5.7 Construction and working principle and applications of (a)Light emitting diode (LED) (b)7-segment display(common anode and common cathode Type) (c)LCD Display	10
Unit-VI **Integrated Circuit and Surface Mount Devices**	6a. State advantages and Disadvantages of IC's and SMD's 6b. State applications of IC's. 6c. Differentiate between thick film and thin film IC's on the basis of manufacturing techniques and Thickness of film. 6d. Explain the concept of hybrid IC	6.1 Integrated circuits (IC)- Definition, advantages and disadvantages 6.2 Classification of IC's – monolithic, thick and thin film, hybrid, linear and Digital. 6.3 Thin film technology, thick film Technology. Manufacturing of monolithic IC, photolithography 6.4 IC packages, pin identification, 6.5 Surface Mounted Devices 6.6 Concept of SMT and SMD, 6.7 SMD resistor, capacitor, Transistor and ICs	08
Unit-VII **Printed Circuit Board Manufacturing**	7a. State types of PCB 7b. State properties of copper clad. 7c. State rules for artwork design. 7d. Explain PCB manufacturing process. 7e. Describe different soldering methods.	7.1 Introduction to PCB, Advantages, disadvantages of PCB, Types of PCB, Base & Conducting material, types of laminates, 7.2 Properties of copper clad laminate, 7.3 Flowchart for preparation of PCB. 7.4 Layout Design, Artwork rules, Screen printing, photo printing method, Drilling, Mounting of components 7.5 Soldering technique: Methods of	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		soldering, Dip, wave and Hand soldering, necessary conditions for soldering Hard & soft solder, soldering alloys, fluxes, soldering defects	
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Resistors	02	08	04	14
II	Capacitors	--	06	04	10
III	Inductors	04	--	04	08
IV	Cables and connectors	02	04	04	10
V	Switches, relays and displays	06	06	04	16
VI	Integrated circuits and surface mount devices	06	04	--	10
VII	Printed Circuit Board Manufacturing	04	04	04	12
	TOTAL	**24**	**32**	**24**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Indentify different types of resistors used in laboratory.	02
2	I	Testing and identification of different types of resistors, find out tolerance and wattage of resistors depending on size. Measure the value of resistor using multi meter and colour code/printed value.	04
3	II	Identify different types of fixed capacitors, test values of capacitors using colour coding and by printed values	02
4	III	Identify the types of inductor. Find out the value of inductance using colour code.	02
5	IV	Identify different types of connectors	02
6	IV	Identify and test different types of cables	02
7	V	Identify different types of switches	02
8	V	Identify different types of relays.	02
9	V	Identify different types of displays	02

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
10	VI	Identify and test different types of IC's	02
11	VI	Identification of SMD components	02
12	VII	Mini- project – Select project, prepare layout, assemble the circuit and test it	08
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare assignments based on practicals performed in Electronic material and components laboratory
2. Market survey of various components
3. Collect specifications of different components
4. Collect information regarding different components and application used in industries.
5. Prepare a report on above information related to industry.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Arrange industrial visit
2. Arrange expert lecture on related topic
3. Show videos /power point presentation from renowned experts in the area of electronic material and components.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book (s)	Author (s)	Publication
1	Electronic Materials and component	S. M. Dhir	Tata McGraw Hill, New Delhi
2	Electronic Materials and component	Grover and Jamwal	Dhanpat Rai and Sons, New Delhi
3	Electronic Materials and component	Madhuri Joshi	Tata McGraw Hill, New Delhi
4	Electronic component Handbook	Thomas H. Jones	Reston publishing company
5	Handbook of components for electronics	Harper (Charles A)	Laxmi Enterprise, Bombay

B) Software/Learning Websites

1. www.electroniccomponent.com
2. www.digikey.com/product-search/en
3. www.electronicswitches.in/
4. Express PCB (web version/ student evaluation version)

C) Major Equipments/ Instruments with Broad Specifications

1. Analog & Digital Mutimeters.
2. Resistors, capacitors, inductors of different values and ratings
3. Different types of Cables, Connectors, switches, Relays.
4. Analog and Digital IC's
5. Different types of display devices : LCD and LED
6. IC Tester.
7. Breadboards of different configurations
8. PCB Lab set up including different instruments and equipments.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		H	H	H	M					
CO2		M	M	M	H	H					
CO3		H	H	H	H	H					
CO4	H										
CO5			H	H	H						
CO6	H		H	H							

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Engineering Workshop Practice (EWS) **COURSE CODE :** 6127

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Engineering diploma technician is expected to know conventional workshop practices like sheet metal working, wood working, Fitting, Drilling, Tapping and lathe working processes. The students are required to identify, operate and control various power tools and machines. They should be able to select and use various tools and equipments for various operations and processes like w, fitting, taping, sheet metal working and turning.

The students are advised to undergo each skill experience with remembrance, understanding and application with special emphasis on attitude of enquiry to know why and how for the various instructions and practices imparted to them in each shop.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop basic engineering workshop skills.
2. Impart basic know how of various hand tools and their uses in
3. Different sections of workshop.
4. Enhance hands on experiences to learn manufacturing processes.
5. Develop a skill in dignity of labour, precision at work place, team
6. Working and development of right attitude.
7. Adopt safety practices while working on shop floor.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes

1. Know basic workshop processes.
2. Read and interpret job drawing.
3. Identify, select and use various marking, measuring, holding, striking and Cutting tools & equipments.
4. Operate, control different machines and equipments.
5. Inspect the job for specified dimensions.
6. Produce jobs as per specified dimensions.
7. Adopt safety practices while working on the shop floor.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction of Workshop**	1a. Sketch general workshop layout. 1b. Follow preliminary safety rules in workshop.	1.1 Workshop layout. 1.2 Importance of various shops/ sections of workshop. 1.3 Types of jobs to be done in different sections of workshop. 1.4 General safety rules and work procedures in the workshop.	04
Unit-II **Wood Working Section**	2a. Select appropriate 2b. Fitting tools for required application. 2c. Prepare the simple Job as per drawing and specifications by using carpentry /wood working tools.	2.1 Types, sketch, specification, material, applications and methods of using of carpentry tools-saws, planner, chisels, hammers, pallet, marking gauge, vice, try square, rule etc. 2.2 Types of woods and their applications. 2.3 Types of carpentry hardware's and their uses. 2.4 Demonstration of carpentry operations such as marking, sawing, planning, chiselling, grooving, boring, joining etc. 2.5 Preparation of wooden joints. 2.6 Safety precautions.	12
Unit-III **Fitting Section**	3a. Select appropriate Fitting tools for required application. 3b. Prepare the simple Job as per drawing and specifications by using fitting tools.	3.1 Sketches, specifications and applications of different work holding fitting tools. Fitter's bench vice, V-block, Clamps. 3.2 Sketches, specifications, material, applications and methods of using fitting marking and measuring tools-marking table, surface plate, angle plate, universal scribing block, try-square, scriber, divider, centre punch, letter punch, calipers, digital vernier calipers, height gauge etc. 3.3 Types, sketches, specifications, material, applications and methods of using of fitting cutting tools hacksaw, chisels, twist drill, taps, files, dies. 3.4 Types, sketches, specifications, material, applications and methods of using of fitting finishing tools-files, reamers. 3.5 Sketches, specification s and applications of miscellaneous tools, hammers, spanners, screwdrivers sliding screw wrench. 3.6 Demonstration of various fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, tapping.etc.	16

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		3.7 Preparation of simple job with drilling tapping and saw cut. 3.8 Safety precautions at work place in fitting section.	
Unit-IV **Sheet Metal Working**	4a. Select appropriate sheet metal working tool for the required application. 4b. Prepare the simple job as per specification using sheet metal working tools.	4.1 Concept and conversions of SWG and other gauges in use. 4.2 Use of wire gauge. 4.3 Types of sheet metal joints and applications. 4.4 Types, sketch, specification, material, applications and methods of using sheet metal working tools/tin smithy tools-hammers, stakes, scissors/ snips etc. 4.5 Demonstration of various sheet metal working tools/tin smithy tools and sheet metal operations such as shearing, bending and joining. 4.6 Preparation of sheet metal job. 4.7 Observe Safety precautions.	16
Unit-V **Metal Turning**	5a. Explain the construction and working of center lathe machine. 5b. Identify and select the operation for the required job. 5c. Select appropriate metal turning tool for the required application. 5d. Prepare the simple job as per manufacturing drawing specifications and dimensions.	5.1 Center lathe • Introduction • Block diagram • Construction details and functions of each part. • Various attachments and accessories. • Lathe work cutting tools. • Lathe operations. 5.2 Specifications of centre lathe. 5.3 Demonstration of lathe operations and use of various turning tools, accessories and attachments. 5.4 Preparation of metal turning job. 5.5 Observe Safety precautions.	16
		TOTAL	64

5.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours.
1	I	Prepare wood working and fitting shop layout.	04
4	II	Demonstrate use of different wood working tools. Student will also prepare the report with sketch, specifications and applications of wood working tools demonstrated.	04
5	II	Wood Working Shop One Job Prepare one Job From the following, involving different joints, Turning and paining operation, surface finishing by emery paper, varnishing and polishing e.g. Chaurang and pat, Table, Racks etc. group of 2 to 4 students depending on volume work. OR One simple job involving any one joint like mortise and tendon dovetail bridle half lap etc. One Job per student / preparation of switch board or any other similar job	12
2	III	Demonstrate use of different fitting tools –like work holding, marking, measuring, cutting, finishing and miscellaneous. Student will also prepare the report with sketch, specifications and applications of fitting tools demonstrated.	04
3	III	Fitting shop One Job Prepare one simple fitting job as per given drawings and specifications involving practice of filing, drilling, tapping, cutting etc. Such as Regulator Heat sink, Transistor Heat Sink or any other similar job.	08
4	IV	Demonstrate use of different sheet metal working tools/machines. Student will also prepare the report with sketch, specifications and applications of tools demonstrated, different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering and riveting.	04
5	IV	Sheet metal working One job. Prepare one sheet metal job as per drawing having shearing, bending, joining, soldering and riveting. Such as Battery Eliminator Box or any other similar job	12
6	V	Demonstrate lathe operations like facing, centering, plain turning, step turning, taper turning, grooving, chamfering, knurling, parting off and use of various turning tools, accessories and attachments.	04
7	V	Metal turning One job. Preparation of turning job involving Plain, Step, Taper turning, threading, Chamfering and Knurling operations (Group of 2 students)	12
		TOTAL	**64**

6.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1 Prepare reports as asked in the workshop practical assignment.
2 Visit the nearer timber and ply wood merchant. Collect the information on types and appearance of wood being sold by them.
3 Visit the nearer work shop to observe the various lathe operations performed.
4 Down load the catalogues of lathe machine used by them and study their specifications.
5 Down load videos showing correct practices for fitting, wood working, sheet metal working and lathe work.
6 Assignments on accessories and attachments used on lathe machine.

NOTES:

a. It is compulsory to follow safety norms while working in the sections of workshop.
b. Preparation Workshop book is compulsory. Record of activities performed by student in each period is also compulsory and must be duly certified by concerned technical staff and teacher in routine workshop book.
c. Keep your all tools duly re-sharpened/ready.
d. It is compulsory to submit reports of student activities and workshop book.
e. Student activities are compulsory to perform by each student.
f. Students are to be continuously assessed for competencies achieved.
g. Each student is required to submit the specified term work

7.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Demonstration,
2. Show CAI computer software related to workshop technology.
3. CBT Packages.

8.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1.	Mechanical workshop practice.	K.C. John	PHI
2	Workshop Technology-I.	Hazra and Chaudhary Media.	promoters & Publisher private limited
3	Workshop Technology-I.	W.A. J. Chapman	Taylor & Francis.
4	Comprehensive Workshop Technology (Manufacturing Processes).	S.K. Garg	Laxmi publications.
5	Workshop practice manual.	K. Venkata Reddy	B.S. Publications.
6	Workshop familiarization.	E. Wilkinson	Pitman engineering craft series.
7	Workshop Technology	B. S. Raghuwanshi	Dhanpat Rai and Sons, New Delhi
8	Workshop Technology	H. S. Bawa	Tata McGraw Hill Publishers, New Delhi
9	I.T.B. Handbook.	-	Engineering industry Training Board.
10	Production Technology Hand Book HMT	-	Tata-McGraw Hill Publisher, New Delhi.

B) Software/Learning Websites

1. http://www.nptel.ac.in/name of topic/lecture/video
2. http://www.howstuffworks.com
3. http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf
4. http://www.solderingtechnology.org
5. http://www.newagepublishers.com/samplechapter/001469.pdf
6. http://www.youtube.com/watch?v=TeBX6cKKHWY
7. http://www.youtube.com/watch?v=QHF0sNHnttw&feature=related
8. http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu
9. http://www.piehtoolco.com
10. http://sourcing.indiamart.com/engineering/articles/materials-used-hand-tools/
11. http://www.lathemachinesindia.com/lathe-machine.html
12. http://www.hnsa.org/doc/pdf/lathe.pdf

C) Major Equipments/ Instruments

Sr. No	Name Of Equipments/ Instruments	Qty
	Wood working Section	
1	Circular saw	1
2	Jig - saw	1
3	Wood Planer	1
4	Drilling Machine Bench Type	1
5	Universal wood working Machine	1
6	Bench Grinder	1
7	Hand Tools Kit	20 Sets
8	Carpentry Bench Vice	20
9	Wood Turning Lathe	5
10	Measuring Tools & Gauges	20 Sets
11	Electrician Tool Kit	2
12	Carpentry Work Bench	20
13	Band Saw	1
14	Band saw and Circular Saw Sharpener	1
15	Chain And Chisel Mortising Machine	1
16	Vertical Sander	1
17	Heavy Duty Circular Saw	1
18	Heavy Duty Variable Speed Reciprocating Saw Kit	1
19	Single Speed Impact Drill.	1
20	ANGLE GRINDER.	1
21	Cordless drill (Keyed Chuck)	1
22	Heavy Duty palm grip sander	1
23	Heavy Duty Router	1
	Fitting Shop	
1	Marking Table with scribers	2
2	Surface plate	2
3	Measuring Instruments, Marking Instruments, Fitting Hand Tools	2 Each
4	Tap & die set.	5 Sets
5	Bench Drilling Machine	1
6	Bench Grinder	1
7	Fitting Shop Vice Size- 100/150 mm.	20
8	Electrically operated Hand Drilling Machine (pistol Type)	2
9	Power Hack Saw Machine	1
10	Pedestal Grinder	1
11	Hand Grinder	1
12	Fitter's Work Bench	10
13	Hand Press Double (Pillar Type)	1
14	Arbor Press	1
	Sheet Metal Shop	
1	Shearing Machine	1
2	Sheet Bending Machine	1
3	Soldering Iron	5
4	Sheet metal working Hand Tools and other Equipments	1
5	Spot welding machine	1
6	Portable Drilling Machine	1
7	Stoving Oven	1
8	Sheet Metal Work Bench Size-1800 x 1200 x 750 mm with stake	2
9	Swaging Machine	1
10	Universal sheet Folding Machine	1
11	Double Column Power Press	1

12	Hydraulic Press	1
13	Circle Cutting Machines	1
	Turning Section	
1	Lathe Machine with standard accessories and attachments	10
2	Required cutting Tools and Tool Holders	10 Set
3	Required measuring Tools	10 Set
4	Hack Saw machine	1

Note:- Latest Technology & specifications are to consider at the time procure

9.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		H							M	L	M
CO2		M							M		
CO3	H										
CO4			H	M							M
CO5		M	H	L				H			
CO6			H		M		H	H			
CO7			H			L	H				

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Basic Electronics (BTX) **COURSE CODE :** 6244

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

This course will help the students to improve their knowledge and grasp the most fundamental concepts of electronic devices and circuits. Basic Electronics is concerned with the fundamental building blocks in electronic technology, giving the student an understanding of the basic circuits & the applications.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand operating principle of semiconductor devices
2. Know the use of semiconductor devices in electronic circuits
3. Analyse the characteristics of electronic devices
4. Understand the working of basic circuits such as rectifiers, amplifiers etc.
5. Build and test simple electronic circuits

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Select appropriate semiconductor devices required for various electronic applications.
2. Select an electronic circuit according to application requirement.
3. Assemble an electronic circuit.
4. Trace the faults in electronic circuit using voltage and waveform methods.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Semi-conductor diode**	1a. Categorize different semiconductor diodes. 1b. Describe with sketch construction, operation and applications of PN junction diode and zener diode. 1c. Describe with sketch construction, operation and applications of LED and photodiode	1.1 Semiconductor diode: Symbol, constructional diagram, operating principle, V-I characteristic and applications of PN junction and zener diode. 1.2 Symbol, constructional diagram, operating principle, V-I characteristic and applications of Light emitting diode (LED) and Photodiode	08
Unit-II **Diode rectifiers and filters**	2a. Categorize diode rectifiers and filters. 2b. Draw the circuit and explain operation of Half Wave Rectifier, Full Wave Rectifier (center-tapped) and Full Wave Bridge Rectifier along with waveform.	2.1 Classification of rectifiers. 2.2 Circuit diagram and operation of Half Wave Rectifier, Full Wave Rectifier (center-tapped), Full Wave Bridge Rectifier. 2.3 Classification of filters 2.4 Circuit diagram, operation and waveforms of Capacitor, Choke,	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	2c. Draw circuit and explain operation of different types of filters. 2d. Define Peak Inverse Voltage, Ripple Factor, Form Factor and Transformer Utilization Factor of diode rectifiers.	LC and π type filter.	
Unit-III **Bipolar Junction transistor**	3a. Categorize different BJT & BJT Configurations. 3b. Describe DC and AC load line with the help of an example. 3c. List various BJT biasing methods. 3d. Draw circuit diagram and state the operation of Various BJT biasing methods. 3e. Compare different BJT biasing methods.	3.1 Classification of BJT. 3.2 Circuit diagram, operation and Input -Output characteristics of CB, CE, CC configurations of BJT. 3.3 DC and AC load line. 3.4 Circuit diagram and operation of fixed bias, fixed bias with emitter resistance, collector to base bias, voltage divider biasing Methods of BJT.	12
Unit-IV **Single and multistage amplifiers**	4a. Describe the principle of single and multistage amplifiers and state its need 4b. State different coupling methods used in BJT amplifiers. 4c. Draw the circuit diagram and explain the working of different Coupling Methods of amplifiers.	4.1 Principle, circuit diagram, working of single stage amplifier 4.2 Principle of multistage amplifier and its need 4.3 Circuit diagram, working, frequency response curve, bandwidth and applications of RC-coupled, transformer coupled, direct coupled amplifiers	12
Unit-V **Field Effect transistor**	5a. Classify Field effect transistors. 5b. Draw constructional diagram and working principle of JFET and MOSFET.	5.1 Classification of FET 5.2 Symbol, constructional diagram, working principle, V-I characteristics, parameters and applications of JFET 5.3 Symbol, constructional diagram, working principle and applications of MOSFET	12
Unit-VI **Regulated Power supply**	6a. Draw block diagram and explain operation of regulated power supply. 6b. Categories different Voltage regulators. 6c. Describe circuit diagram and explain operation of different voltage regulator circuits.	6.1 Block diagram and operation of Regulated power supply. 6.2 Circuit diagram and operation of Zener voltage regulator. 6.3 Circuit diagram and operation of Transistorized series and shunt voltage regulator 6.4 Circuit diagram and working of 78XX and 79XX voltage regulator.	10
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Semiconductor diode	08	04	02	14
II	Diode rectifiers and filters	08	02	02	12
III	Bipolar Junction transistor	08	04	02	14

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
IV	Single and multistage amplifiers	08	04	02	14
V	Field Effect transistor	10	02	02	14
VI	Regulated Power supply	04	04	04	12
	TOTAL	**46**	**20**	**14**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Plot V-I characteristics of PN junction diode and find out its knee voltage.	02
2	I	Plot V-I characteristics of Zener diode and find out the Zener voltage.	02
3	I	Plot V-I characteristics of LED.	02
4	I	Plot V-I characteristics of photodiode.	02
5	II	To construct and test half wave rectifier and draw input–output Waveforms.	04
6	II	To construct and test Full wave rectifier and draw input–output Waveforms.	04
7	II	To construct and test Bridge full wave rectifier and draw input-output waveforms.	04
8	II	To construct and test power supply using full wave rectifier with capacitor input filter. Measure output voltage (DC) with and without filter.	04
9	II	To construct and test power supply using full wave rectifier with **π** filter. Measure output voltage (DC) with and without filter	04
10	III	To plot input-output characteristics of BJT in CE mode.	04
11	III	To plot input-output characteristics of BJT in CB mode.	04
12	IV	To plot frequency response of CE amplifier and find out Gain-Bandwidth product of given circuit.	04
13	IV	Construct and plot frequency response of RC coupled amplifier and find out Gain-Bandwidth product of given circuit.	04
14	V	Plot V-I characteristics of FET.	04
15	VI	Construct and test performance of Zener voltage regulator	04
16	VI	Construct and test performance of Transistor series regulator	04
17	VI	Construct and test performance of Transistor shunt regulator	04
18	VI	Performance of three terminal voltage regulators (78XX and 79XX)	04
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Download data sheets of Semiconductor diode, Zener diode, BJT, FET.
2. Collect data about specifications and ratings from the datasheets.
3. Collect data about prices of Semiconductor diode, Zener diode, BJT, FET from local market.
4. Build DC regulated power supply.
5. Prepare layout and artwork of power supply using IC (78xx and 79xx).
6. Conduct the market survey for regulated power supply and collect the specifications.
7. Mini project based on transistor as a switch, single stage CE amplifier.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic active components, devices and circuits.
2. Arrange a visit to PCB and power supply manufacturing industry.
3. Arrange expert lecture of an industry person in the field of electronics.
4. Arrange faulty electronic circuit and provide to students for repairing.(Case Study)
5. Encourage students to build electronic circuits

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	A text book of Applied Electronics	R.S. Sedha	S. Chand Publishers, New Delhi
2	Principles of Electronics	V.K. Mehta	S. Chand Publishers, New Delhi
3	Electronic Devices and Circuits	G.K. Mittal	Khanna Publishers, New Delhi
4	Basic Electronics	B.L. Theraja	S. Chand Publishers, New Delhi
5	Electronic Principles	Malvino	McGraw Hill, New Delhi
6	Electronic Devices and Circuits	A. Motershed	PHI, New Delhi
7	Basic Electronics and Linear circuits	N.N. Bhargava S.C. Gupta	Tata McGraw Hill Education, New Delhi

B) Software/Learning Websites

1. http://www.electronicstheory.com
2. http://www.nptl.com
3. http://www.electronictutorial.com
4. http://www.allaboutcircuit.com

C) Major Equipments/ Instruments with Broad Specifications

1. **Cathode ray oscilloscope :** Dual Channel, 4 Trace CRT / TFT based, Bandwidth 20 MHz/30 MHz, X10 magnification, 20 nS max sweep rate, Alternate triggering, Component tester and with optional features such as Digital Read out, USB interface.
2. **Function Generator :** 1 MHz, sine, square, triangular, ramp and pulse generator Freq range 0.01 Hz to 1 MHz, Output amplitude 20V open circuited, Output impedance 50 ohms. Facility to indicate output frequency & amplitude on display.
3. Regulated power supply : 0 to 30V 2A/3A dual DC regulated power supply with SC protection digital output meters for current and Voltage
4. CRO Probes
5. V-I Characteristics of PN diode – Experimental kit
6. V-I Characteristics of zener diode – Experimental kit
7. half wave rectifier – Experimental kit
8. Full wave rectifier – Experimental kit
9. Bridge Full wave rectifier with and without filter– Experimental kit
10. I/O characteristics of CE, CB Configuration – Experimental kit
11. I/O characteristics of FET – Experimental kit
12. Single stage and Multistage amplifier – Experimental kit

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1			H	H	M	H					
CO2	H				H	H					
CO3			H	H	H	H					
CO4			M	M	H	H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Electronic Measurement and Instruments (EMN) **COURSE CODE:** 6245

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	--	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	

1.0 RATIONALE:

This course intends to teach the students facts, concepts, principles and procedure of analog & digital electronic measuring instruments. The measurement techniques for the measurement of various electrical quantities can be used for testing & troubleshooting whenever the student performing his role as supervisor or assistant in research and development.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know the different parts of measurement instruments
2. Understand basic facts and concepts of measurements.
3. Know calibration procedure.
4. Describe operation of analog and digital meters.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify the different parts of measurement instruments
2. State the basic facts and concepts of measurements.
3. Calibrate the instruments.
4. Measure different electrical quantities using analog and digital instruments.
5. Selecting the appropriate instruments for measurement
6. Test electronics components.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fundamentals of Measurements**	1a. State and explain the different types of instruments, errors, standards, characteristics of instruments. 1b. Define fundamental and derived unit of measurement and list all the units of measurement. 1c. State and explain importance of grounding. 1d. Explain the need of calibration	1.1 Classification of instruments-Absolute Instruments, Secondary Instruments 1.2 Characteristics of instruments ▪ Static-Accuracy, Precision, sensitivity, Resolution, Static error, Reproducibility, Drift, Dead zone. ▪ Dynamic-speed of response, Lag, Fidelity, Dynamic error. 1.3 Types of error-Gross, Systematic and Random. 1.4 Units of measurement fundamental, Derived. 1.5 Standards and their Classification - International, Primary, Secondary, Working. 1.6 Calibration of Instruments-definition,	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		need etc. 1.7 Grounds-Importance of ground, Grounding, Grounding techniques, Equipment of grounding for safety.	
Unit-II **Analog DC and AC Meters**	2a. Classify the analog instruments. 2b. Define Average and RMS value. 2c. Draw the construction of PMMC and explain its operation and design analog DC, Analog AC meters for the different ranges. 2d. Draw circuit diagram and explain operation analog multimeter.	2.1 Classification of Analog Instruments. 2.2 Definition of Average and RMS value. 2.3 PMMC-Working Principle, Construction, Sources of torque. ▪ Analog DC Ammeters and Voltmeters. ▪ Analog AC Ammeter and Voltmeter-Average Responding (Rectifier type) 2.4 Analog Multimeter- Circuit diagram and operation.	12
Unit-III **Digital Instruments**	3a. State Resolution, Sensitivity and Accuracy of digital display. 3b. Draw block diagram and explain operation of digital instruments 3c. State applications of different digital instruments.	3.1 Resolution, Sensitivity and Accuracy of digital display. 3.2 Digital frequency meter-Block Diagram and operation only. 3.3 Digital Voltmeter-Ramp type DVM, Integrating type DVM, Successive approximation type DVM, Dual slope type DVM. (Block diagram, Operation and waveforms) 3.4 Digital Multi meter -Block Diagram and operation. 3.5 LCR, Q- meter-Block diagram and operation only. 3.6 Digital phase meter-Block diagram and operation only.	10
Unit-IV **Oscilloscope**	4a. Draw neat labeled block diagram of CRO and DSO 4b. List specifications and applications of CRO and DSO. 4c. Draw internal structure of CRT and State its working Principle. 4d. Explain vertical deflection system and Horizontal deflection system. 4e. Draw block diagram of CRO probe and explain types of CRO probes.	4.1 Display system – CRT, construction and operation. Deflection of electron beam in CRT, Electrostatic and Electromagnetic deflection. 4.2 Vertical deflection system- Input coupling selector, input attenuator, pre-amplifier, main vertical amplifier, delay line 4.3 Horizontal deflection system –Trigger circuit, time base generator, Main horizontal amplifier. 4.4 CRO Probes- General block diagram of CRO probe, passive voltage probe and their compensation, active voltage probes, current probes. 4.5 CRO – Block diagram of single beam-single trace, single beam -dual trace oscilloscope. 4.6 CRO–specifications (single beam-dual	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		trace) 4.7 Block diagram of Digital storage oscilloscope (DSO). 4.8 Measurement of amplitude, time period, frequency and phase using CRO, tracing of diode and transistor characteristics using CRO.	
Unit-V **Signal Generator and Wave Analyzer**	5a. State the need of signal generator, Spectrum and logic analyzer. 5b. Draw block diagram and explain operation of different signal generators, Spectrum and logic analyzer and its applications. 5c. List specification of Function generator and pulse generator, Pattern generator.	5.1 Concept of signal generator 5.2 Need, block diagram, operation, applications and specifications of signal generators: AF and RF type, function generator and pulse generator, Pattern generator 5.3 Need, block diagram, operation, applications and specifications of spectrum and logic analyzer	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Fundamentals of Measurements	08	04	04	16
II	Analog DC and AC Meters	04	08	08	20
III	Digital Instruments	04	06	04	14
IV	Oscilloscope	06	08	04	18
V	Signal Generators and wave Analyzers	04	02	06	12
		26	**28**	**26**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

6.0 ASSIGNMENTS/PRACTICALS/TASKS: (Any 10)

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	II	Observe and Identify the parts of PMMC analog instruments and perform measurement of	04

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		• DC voltage, DC Current • AC voltage, AC current • Resistance	
2	III	Observe front panel controls of Digital multimeter and perform measurement of • DC voltage, DC Current • AC voltage, AC current • Resistance • Continuity testing	04
3	II	Find the RMS and Average values by the AC measurement.	02
4	III	Observe front panel controls of LCR-Q meter and measure-Resistance, Inductance, Capacitance and Q- factor	02
5	III	Measure phase angle using Digital phase meter.	02
6	IV	Observe front panel controls and record specifications of a typical CRO.	02
7	IV	Measure frequency, voltage, phase difference (by time measurement) using CRO	02
8	IV	Testing of components using CRO. (Resistors, Capacitors, Transformers, PN junction diode, Zener Diode and LED). Draw the observed nature of patterns/waveforms.	04
9	IV	Using Lissageous pattern on CRO measure frequency and phase difference of unknown signal.	02
10	IV	Observe front panel controls of DSO and Measure frequency and voltage using DSO.	04
11	V	Measure frequency and voltage of different waveforms available at the output of function generator	02
12	V	Observe front panel of pattern generator. Observe different patterns on it.	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Identify different parts of different electronic measurement instruments.
2. Prepare journals based on practical performed in electronic measurement and instrument in laboratory.
3. Skillfully handle all the measurement instruments and performs measurement.
4. Visit to any electronic measurement and instrument company and prepare a report on it.
5. Develop mini-projects such as design of analog meters (Ammeters, Voltmeters), for minimum and maximum range of analog meters using basic meters.
6. Case Study: Based on fault finding of any instrument, troubleshoot electronic circuits and Testing to find the faulty components using different instruments.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Lecture method
2. Arrange video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic measurement and instruments.
3. Arrange a visit to any electronic measurement industry or manufacturing industry of electronic measurement instruments, national laboratory of measurement etc
4. Arrange expert lecture of any industry person or any Academics person in the area of Electronic measurement and instrument, CRO, Analog meters etc.
5. Prepare PowerPoint presentations on CRO, Analog meters, Digital meters etc.
6. Take one day workshop from any industry expert (Supervisor, Technician) on how to perform measurement, handling of instrument, calibration of instruments, testing etc.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author(s)	Publication
1	Electrical and Electronic Measurements and instrumentations	A. K. Sawhney	Dhanpat Rai and Co. 2010
2	Electronic Instruments	H. S. Kalsi	Tata McGraw Hills 2012
3	Electronic Instrumentation and Measurement tech.	W. D. Cooper	Prentice Hall 1978
4	Student Reference manual for Electronic Instrumentation laboratory	Stanley Wolf and Richard Smith	P. Hall 2004
5	Electronic Measurements and Instrumentation	K Lal Kishore	Pearson 2010

B) Software/Learning Websites

1. www.youtube.com/videos of electronic measurement and instruments
2. www.texasinstruments.com
3. http://en.wikipedia.org
4. www.electrical4u.com
5. www.radio-electronics.com/info/generators/signal-generator-

C) Major Equipments/ Instruments with Broad Specifications

Sr. No.	Name of Equipments/ Instruments	Broad Specifications
1	Cathode ray oscilloscope	Dual Channel, 4 Trace CRT / TFT based Bandwidth 20 MHz/30 MHz X10 magnification 20 nS max sweep rate, Alternate triggering Component tester and with optional features such as Digital Read out, USB interface Any other Oscilloscope with additional features are also suitable
2	Dual Regulated power supply	0 to 30 V 2A/3 A dual DC regulated power supply with SC protection digital output meters for current and Voltage
3	Analog Multimeter	Suitable to measure AC/DC voltage, Current and Resistance DC voltage Range 400mV to 1000 V AC Voltage Range 4V to 750 V DC current 4 mA to 10A AC current 4 mA to 10 A Resistance 400 Ohm to 40 Mohm or any other better specifications and facilities
5	Digital Multimeters	3.5 digit with R, V, I measurements, diode and BJT testing
8	Digital storage oscilloscope	Bandwidth : 50/100MHz TFT Colour LCD Dual Channel Real Time Sampling: 1GSa/s Equivalent Sampling 25GSa/s Memory 1M pts 10 Waveforms and 10 Setups can be stored Auto set Function s 20 Auto Measurement of Vpp, Vmax, Vmin, Vtop, Vbase, Vamp, Vavg, Vrms, Overshoot Preshoot, Frequency, Risetime, Falltime, Delay 1 -2, Delay 1 -2, +Width, -Width, +Duty, -Duty Mathematical Functions : Add, Subtract, Multiply and FFT Adjustable Digital Filters (HPF, LPF, BPF and BRF) Cursor Measure : Auto, Manual, Track Single shot triggering mode Built-in FFT and USB Interface Ultra scope: PC control and Analysis Software Interpolation sinx/x Acquisition

Sr. No.	Name of Equipments/ Instruments	Broad Specifications
		Modes : Normal, Average, Peak detect or any other better specifications
9	Function Generator	1 MHz, sine, square, triangular, ramp and pulse generator Freq range 0.01 Hz to 1 MHz, Output amplitude 20V open circuited, Output impedance 50 ohm Ohms. Facility to indicate output frequency and amplitude on display.
10	LCR Q meter	Parameter L-Q, C-D, R-Q and Z-Q Frequency 00 Hz, 120 Hz and 1 KHz Accuracy Basic Accuracy : 0.3% Display 5 digits display for both primary and secondary parameters L 100 Hz, 120 Hz 1 mH - 9999 H 1 KHz 0.1 mH - 999.9 H Measurement C 100 Hz, 120Hz 1 pF - 9999 mF Range 1 KHz 0.1 pF - 999.9 mFD, Q 0.0001 – 9999 D% 0.0001% - 9999%Test Level 120 Hz 0.3 Vrms (1 ±15%)(Range Auto 1 KHz and Open 100 Hz 0.42 Vrms (1±15%)Circuit) Ranging Mod Auto and Hold Equivalent Parallel and Series Circuit Display Direct, DABS and D% Correction Open and Short Zeroing Terminals 4 terminals Comparator 4 Bins : NG, P1, P2 and P3 D% -9999% - 99999%
11	TV pattern generator	Various test pattern output (May be shared with other lab)

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	M	H	H			H					
CO2	H	H	M	M	M	M					
CO3	H		M	M	H	M					
CO4	M				H	H					
CO5	M				H	M					
CO6	H		H		H						

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Industrial Instrumentation (INI) **COURSE CODE :** 6246

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

Reliable Measurements of various process quantities has been important for trade and commerce for Industrial activities. Modern Engineering practices require adequately precise and fast measurement. This course deals with measurement principles of process parameters like pressure, flow, level, temperature, displacement, humidity etc. covering nearly the entire gamut of industrial measurement. Transducers are used for Measurement of these parameters. Their specifications, limitations and applications, along with their static and dynamic behavior are important for studying this course.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Define physical quantities with proper units to ensure precise technical communication about the results of measurements.
2. Understand the concepts of different types of transducers and compare them on the basis of their performance, characteristics and applications.
3. Understand the nature and working of instrumentation systems.
4. Understand the operating principle of transducers for measurement of different physical quantities.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify and select different transducers for industrial applications.
2. Draw and explain the construction and operation of different transducers used to measure physical quantities.
3. State specifications, advantages and disadvantages of different transducers.
4. Use different transducers for measurements of physical quantities.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Transducers and Recorders**	1a. Define transducer 1b. Compare different transducers 1c. Selection of specific transducers. 1d. Draw and explain block diagram of instrumentation system. 1e. Need and explanation of recorders	1.1 Definition and need of transducers. 1.2 Classification of transducers: active, passive, primary, secondary, analog and digital. 1.3 Selection criteria of transducers 1.4 Block diagram and explanation of each block in instrumentation system. 1.5 Recorders-need, types, strip chart and X-Y recorders, their block diagram, working, construction, advantages, disadvantages and	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		applications.	
Unit-II **Temperature Measurement**	2a. Explain different temperature measuring scales and state need of temperature measuring scales 2b. List different temperature measuring transducers 2c. Explain the construction and working of different temperature measuring transducers with neat diagram	2.1 Temperature- definition, units, need, different scales. 2.2 Classification of temperature measuring transducers. 2.3 Construction, Operating principle, advantages, disadvantages and applications of following transducers a. Filled system- gas filled thermometer. b. Thermistor types-PTC and NTC c. Bimetallic thermometer. d. RTD (Pt-100), 2, 3, wire system (diagram only) . e. Thermocouple- Seebeck and Peltier effects, law of intermediate temperature and metal. f. Thermocouple types: J, K, R, S and T. g. Pyrometers – optical and radiation.	12
Unit-III **Pressure Measurement**	3a. State need of pressure measurement 3b. Draw and explain elastic and non elastic pressure transducers 3c. Draw and explain electronic pressure transducers 3d. Explain the dead weight tester.	3.1 Pressure- definition, need, types, units, (absolute atmospheric gauge and vacuum). 3.2 Classification of pressure measuring devices. 3.3 Principle of working, construction, advantages, disadvantages and applications of : a. Non elastic pressure transducers. b. Elastic pressure transducers – bourdon tube, bellows, diaphragm and capsule. c. Electronic pressure transducers- LVDT, strain gauge and piezoelectric. d. Dead weight tester -Calibration of pressure gauge using dead weight tester.	12
Unit IV: **Flow Measurement**	4a. List of different types of flow and state need of flow measurement. 4b. List different types of flow measuring transducers. 4c. Draw and explain construction and working of different flow measuring transducers	4.1 Flow- definition, types of flow- laminar, turbulent and Reynold's number. 4.2 Classification of flow measuring transducers. 4.3 Principle of working, construction, advantages, disadvantages and applications of: a. Variable head flow meter- venturi tube and orifice plate.	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		b. Variable area flow meter- rotameter. c. Electromagnetic flow meter. d. Ultrasonic flow meter- Time difference and Doppler type.	
Unit V : **Level Measurement**	5a. State need of level measurement 5b. List different level measuring methods 5c. Draw the constructional sketch and explain working of different level measuring transducers	5.1 Level-definition, need of level measurements, classification of level measurement methods. 5.2 Principle of working, construction, advantages, disadvantages and applications of- a. Float type level gauge. b. Resistive type level gauge. c. Capacitive type level gauge. d. Ultrasonic type. e. Radiation type level gauge.	10
Unit VI: **Measurement of Speed, Humidity and Thickness**	6a. Define humidity 6b. List different types of humidity and its unit 6c. Draw the sketch and explain humidity transducers 6d. Draw the sketch and explain speed measuring transducers 6e. List different thickness measuring transducers	6.1 Humidity- types, absolute, relative 6.2 Humidity transducers, a. Sling type-dry and wet bulb thermometer. b. Hair hygrometer. 6.3 Speed measurement- a. Tachogenerators- AC and DC. b. Non contact type- photoelectric type. 6.4 Thickness measurement. a. Differential roller gauge method (contact type device) . b. Capacitance method.	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Transducers and Recorders	04	04	04	12
II	Temperature measurement	04	08	04	16
III	Pressure measurement	02	08	04	14
IV	Flow measurement	02	08	04	14
V	Level measurement	--	08	04	12
VI	Measurement of speed, humidity and thickness	04	08	--	12
	TOTAL	**16**	**44**	**20**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1.	I	List and explain different transducers in the measurement laboratory.	02
2.	I	Draw front panel of strip chart recorder and explain operation of strip chart recorder.	02
3.	II	Plot and analyse the characteristics of RTD.	02
4.	II	Plot and analyse characteristics of thermocouple.	02
5.	II	Plot and analyse characteristics of thermistor.	02
6.	III	Measure pressure by strain gauge.	02
7.	III	Measure pressure by bourdon tube.	02
8.	IV	Measure flow by venturi meter.	02
9.	IV	Measure flow by orifice plate.	02
10.	V	Measure level by capacitive method.	02
11.	III	Measure linear displacement using LVDT.	02
12.	VI	Measure angular speed by tachometer.	02
13.	VI	Humidity measurement by hygrometer.	02
14.		Industrial visit and prepare a report.	06
TOTAL			**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect specifications of various transducers using internet, browsing websites.
2. Identify various transducers.
3. Collect manuals/ photographs of different transducers.
4. Do the assignments on measurement transducers from curriculum.
5. Attend the expert lecture arranged and make report on that.
6. From the electronics magazines find out different latest measuring transducers for physical parameters.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show power points of various transducers.
2. Arrange a visit to related to instrumentation control industry.
3. Arrange expert lecture by industry person in the area of instrumentation, meters etc.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author(s)	Publication
1	Industrial instrumentation and controls	S.K. Singh	Tata McGraw Hill, New Delhi 13:978-0-07-026222-5
2	Electrical and Electronic Measurements and Instrumentation	A.K. Sawhney	Dhanpat Rai and co; New Delhi, 2010
3	Instrumentation System and devices	Rangan, Mani Sharma	Tata McGraw Hill, New Delhi
4	Principles of Industrial Instrumentation	D. Patranabis	Tata McGraw Hill, New Delhi
5	Instrumentation Measurement and Analysis	B.C. Nakra K.K. Choudhari	Tata McGraw Hill, New Delhi

B) Software/Learning Websites

1. www.youtube.com/"type name of instrument"
2. www.controlnet.com
3. www.osvn.com
4. www.proprofs.com/webschool

C) Major Equipments/ Instruments with Broad Specifications

1. Cathode ray oscilloscope : Dual Channel, 4 Trace CRT / TFT based, Bandwidth 20 MHz/30 MHz, X10 magnification, 20 nS max sweep rate, Alternate triggering Component tester and with optional features such as Digital Read out, USB interface, CRO Probes
2. Digital Multimeter : 3.5 digit with R, V, I measurements, diode and BJT testing
3. LCR Q meter: Parameter L-Q, C-D, R-Q and Z-Q Frequency 00 Hz, 120 Hz and 1 KHz Accuracy Basic Accuracy : 0.3%Display 5 digits display.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	H	H	H	M	H					
CO2	H	M	M	M		M					
CO3	H	L	H	M	L	L					
CO4	M		M	M	H	H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Digital Electronics (DEX) **COURSE CODE :** 6247

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

This course is classified under basic technology group and intended to teach the students facts, concepts and principles of working of digital circuits. This course will generate requisite background for understanding of courses such as microprocessor and micro controller.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know various number systems and codes.
2. Understand combinational and sequential logic circuits
3. Understand logic families, data converters and semiconductor memories.
4. Implement simple digital circuits using k-map.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Convert a number from one number system to another.
2. Implement combinational and sequential circuits.
3. Troubleshoot digital circuits.
4. Use different data converters and memories according to applications.
5. Design simple digital circuits for different applications.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Number Systems and Codes**	1a. List different number systems. 1b. Convert one number systems to another. 1c. Perform binary arithmetic. 1d. Explain different codes and their conversion.	1.1 Introduction to digital systems 1.2 Numbers Systems: Binary, Decimal, Octal, Hexadecimal. 1.3 Conversion of one number system to another. 1.4 Binary Addition, Subtraction, Multiplication, Division 1.5 Subtraction using 1's and 2's complement. 1.6 Codes: BCD Code, Excess-3 Code, Gray Code, ASCII code. 1.7 BCD to Excess-3 conversion, Binary to Gray and Gray to Binary code conversion. 1.8 BCD Addition, BCD subtraction using 9's and 10's complement.	10
Unit-II **Logic Gates &**	2a. Draw symbol and write truth table all the gates.	2.1 Symbol equation and truth table of AND, OR, NOT, EX-OR, EX-NOR, NOR and NAND gate.	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Boolean Algebra	2b. State Boolean laws. 2c. Solve examples related to Boolean algebra. 2d. Solve equations using k-map.	2.2 NOR and NAND gate as a universal gates. 2.3 Fundamental concepts of Boolean algebra, Basic Laws: Cumulative, Associative, Distributive, De-Morgan's Theorem, Numerical examples. 2.4 Standard representation of canonical forms SOP and POS, Minterm, Maxterm 2.5 Introduction to K-map: Definition, advantages, representation of 2, 3, 4 variable K-map, K- map reduction technique, don't care condition, Numerical based on the above topic.	
Unit-III **Combinational Logic Circuits**	3a. Implement Adder and subtractor using K-map. 3b. Explain different types of multiplexers and demultiplexers. 3c. Draw Multiplexer and Demultiplexer Tree 3d. Design Encoder circuit. 3e. Explain decoder circuit.	3.1 Definition of combinational logic circuit, half adder, realization of full adder using k-map, half subtractor, Realization of Full subtractor using k-map. Study of IC-7483, 1 –digit adder using IC-7483. 3.2 BCD to 7-segment decoder using k-map 3.3 Multiplexer- Types (2:1, 4:1, 8:1), Necessity, Application, Multiplexer Tree, study of IC-74151 3.4 Demultiplexer-Types, (1:2, 1:4, 1:8) Necessity, Application, Demultiplexer Tree, Study of IC-74155. 3.5 Encoder-Definition, types, Priority Encoder- Decimal to BCD encoder, 3.6 Decoder-Definition, types, (2:4 and 3:8) Study of IC-74138.	14
Unit-IV **Sequential Logic Circuits**	4a. Draw circuit of different flip-flops using logic gates and explain its operation. 4b. Implement asynchronous and synchronous counter circuit using k-map 4c. Draw and explain different types of shift register.	4.1 Define Sequential circuit, Compare combinational and sequential circuit and Edge and Level trigger concept. 4.2 Flip Flops: S-R flip-flop using NAND gates, clocked SR flip- flop with present & clear, clocked J-K flip-flop with present & clear, Master slave J-K flip-flop, D & T flip flops. (Symbol, truth-table and operation), study of IC-7474. 4.3 Counter: Introduction, Types of counter. 4.4 Asynchronous counters- Ripple counter and Ring counter circuit and waveforms. Design example of MOD-N counter. 4.5 Synchronous counter- Implementation of 3-bit synchronous counter using k-map with waveforms. 4.6 Study of IC-7490, Decade counter using IC-7490. 4.7 Shift Register- introduction, circuit diagram and waveforms of SISO, SIPO, PISO, PIPO shift registers, Bi-directional Shift register.	14
Unit-V	5a. State	5.1 Characteristics of logic gates:	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Logic Families and Data Converters	characteristics of logic gates. 5b. Draw and explain operation of TTL and CMOS gates. 5c. Draw and explain operation of DAC techniques. 5d. Draw and explain operation of ADC techniques.	propagation delay, power dissipation, fan in, fan out Noise Margin. 5.2 Circuit and operation of two inputs TTL NAND gate. 5.3 Circuit and operation of two input CMOS NOR gate. 5.4 Comparison of different logic families. 5.5 DAC – Introduction, necessity, R-2R Ladder DAC technique with derivation of output equation. 5.6 ADC- Introduction, necessity, Dual slope, 2-bit Flash type ADC, Successive approximation ADC techniques with circuit and operation.	
Unit-VI **Semiconductor Memories**	6a. Classify different types of memories. 6b. Explain different types of memories.	6.1 Introduction to memories 6.2 Characteristics and classification of memories RAM, ROM, volatile, Non-volatile, static, dynamic and flash. 6.3 ROM types-PROM, EPROM and EEPROM. 6.4 Memory ICs-2716, 6116	06
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Number Systems and Codes	04	04	02	10
II	Logic Gates & Boolean Algebra	04	04	04	12
III	Combinational Logic Circuits	04	08	08	20
IV	Sequential Logic Circuits	04	08	08	20
V	Logic Family and Data converters	04	06	00	10
VI	Semiconductor Memories	02	06	00	08
	TOTAL	**22**	**36**	**22**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	II	Verify truth table of NOT and, OR, EX-OR, EXNOR, NOR, NAND gates.	06
2	II	Implement simple Boolean equation using gates and verify output.	04
3	II	Implement AND, OR and NOT gate using NOR gate and verify truth table.	04
4	II	Implement and verify truth table of DeMorgan's theorem	02
5	III	Implement and verify truth table of Half and Full adder.	02
6	III	Implement and Verify truth table of Half and Full Subtractor	02
7	III	Implement and verify 4-bit binary adder using IC-7483.	02
8	III	Verify truth table of ALU IC 74181	04
9	III	Verify truth table of 8:1 Multiplexer using IC 74151	02
10	III	Verify truth table of 1:8 DeMultiplexer using IC.	02
11	III	Design and implement 2:4 Decoder.	02
12	III	Design and implement 4:2 Priority Encoder.	04
13	IV	Verify truth table of RS and JK flip-flop	04
14	IV	Verify truth table of D and T flip-flop	04
15	IV	Implement 4-bit ring counter using shift register.	04
16	IV	Design and Implement 4-bit asynchronous UP-DOWN counter	04
17	IV	Design and Implement 4-bit asynchronous MOD-5 UP counter	04
18	IV	Design and Implement 3-bit synchronous UP counter	04
19	IV	Implement and verify Decade counter using IC-7490.	04
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Download data sheets of IC-7400, 7404, 7408, 7432, 7486.
2. Download data sheets of IC-74151, 74154, 7483, 7490, 7474, 7476
3. Collect price list of various components required to implement digital circuit.
4. Design and implement mini-project on any combinational or sequential circuit (group of 5 students)

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video/animation film to demonstrate the working of various combinational and sequential circuits.
2. Arrange expert lecture of a person in the area of digital electronics.
3. Arrange faulty circuits and provide to students for repairing.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Modern Digital Electronics	R. P. Jain	Tata McGraw-Hill Education Pvt. Ltd. (TMH) Fourth Edition
2	Digital Principles and Applications	Malvino Leach	McGraw-Hill Education Eighth edition
3	Digital electronics: an introduction to theory and practice	William H. Gothmann	Prentice-Hall 1977

B) Software/Learning Websites

1. http://www.asic-world.com/digital/tutorial.html
2. http://en.wikibooks.org/wiki/Digital_Circuits

C) Major Equipments/ Instruments with Broad Specifications

1. Bread board, LED
2. Regulated power supply +5V DC Supply
3. IC-7400, 7404, 7408, 7432, 7486
4. IC-74151, 74154, 7483, 7490,
5. Experimental kits of combinational circuits.
6. Experimental kits of sequential circuits.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H										
CO2	L	M	M	H							
CO3	L	H	M	L						L	
CO4	L				M						
CO5	L	L	H	H		L					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Linear Integrated Circuits (LIC) **COURSE CODE :** 6248

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

Today the growth of any industry is depending upon electronics to a great extent. Integrated circuit is heart of electronics. This course provides knowledge to students about general analog principles & design methodologies using practical devices and application. It focuses on learning about signal conditioning, signal generation instrumentation, timing and control using various IC circuitries.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand and describe the working of linear integrated circuits
2. Define the Op-amp characteristics, parameters and working principle of OP-AMP and its application.
3. Design electronic circuit using OP-AMP for various mathematical and industrial applications.
4. Analyze and design amplifiers, active filters and waveform generators using Op-Amp.
5. Understand and Develop electronics circuits using working principle of IC-555.
6. Understand and analyze the response of frequency selective circuit such as PLL.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify different op-amp ICs
2. Draw and describe operation of different linear circuits.
3. Design, implement, analyze and test linear circuits using op-amp.
4. Troubleshooting linear integrated circuits

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Operational Amplifier**	1a. Identify various types of ICs and packages 1b. Explain the working of differential amplifier 1c. Draw and describe labelled block diagram of op-amp. 1d. Identify the pin function of IC 741 1e. define different parameters of op-amp 1f. Interpret ideal and practical transfer	1.1 Linear Integrated circuits: classification, packages, pin identification, temperature range and other parameters 1.2 Transistor differential pair, differential amplifier with constant current bias 1.3 Importance of OP-AMP 1.4 Block diagram of op-amp, function of all stages such as balanced, unbalanced differential amplifier with simple current source, level shifter and complementary push pull amplifier. 1.5 OPAMP IC's 741 IC, pin diagram, pin	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	characteristics and electrical characteristics of op-amp	function. Circuit symbols and Terminals, equivalent circuit 1.6 Definitions of parameters of op-amp - Input offset voltage, Input offset current, Input bias current, differential input resistance, Input capacitance, Input voltage range, CMMR, SVRR, large signal voltage gain, supply voltages, supply current, output voltage swing, output resistance, slew rate, gain bandwidth product, output short circuit current, offset voltage adjustment. 1.7 Ideal and practical OP-AMP – Electrical characteristics. 1.8 Ideal voltage Transfer curve, Necessity of frequency compensation, offset nulling.	
Unit-II **OP-AMP Basic Circuits**	2a. Differentiate between open loop and closed loop configuration. 2b. Identify inverting and non-inverting configuration 2c. Design and implement different basic circuits using op-amp. Construct integrator and differentiator and test their performance in various conditions. 2d. Design and test different basic circuit for mathematical operations 2e. Construct integrator and differentiator and test their performance in various conditions	2.1 Open loop and closed loop configuration of Op-Amp, its comparison. 2.2 Virtual ground concept. 2.3 Open loop and Closed loop configuration of op-amp • Inverting • Non-inverting • differential amplifier, • unity gain amplifier (voltage follower), • inverter(sign changer) 2.4 Inverting and non-inverting configuration of Adders • summing amplifier • scaling Amplifier, • Averaging amplifier 2.5 Subtractor. 2.6 Basic and practical Integrator 2.7 Basic and practical Differentiator 2.8 Numerical based on designing of above circuit.	10
Unit-III **Applications of OP-AMP**	3a. Explain the need of signal conditioning and signal processing 3b. State the necessity and requirement of instrumentation amplifier 3c. Compute component values for different instrumentation amplifier using operational amplifier 3d. Develop and test	3.1 Need for signal conditioning and signal processing 3.2 Necessity and requirements of instrumentation amplifier Instrumentation Amplifier using two and three OP-AMP with transducer bridge Circuit diagram, operation, derivation of output voltage Equation. advantages and applications of Instrumentation amplifier 3.3 Sample and Hold circuit 3.4 Log-amplifier, Anti-log amplifier, 3.5 Analog voltage multipliers, Analog	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	different application circuit using op-amp 3e. Use application circuit in area of communication and industry	voltage divider 3.6 Half wave and full wave precision rectifiers 3.7 Voltage to current converter (with floating load, with grounded load) 3.8 Current to voltage converter.	
Unit-IV **Comparators and Detectors**	4a. Use op-amp in nonlinear applications 4b. Assemble and test different types of detectors 4c. Demonstrate the operation of clamping and clipping	4.1 Basic concepts, transfer characteristic and applications of voltage comparator, Inverting and non-inverting comparators 4.2 Inverting and non inverting Zero-crossing detector 4.3 Phase detector 4.4 Peak detectors and Peak to Peak detector 4.5 Window detector 4.6 Schmitt trigger 4.7 Op-amp clamping circuits: Definition of clamper, Positive and negative clampers 4.8 Op-amp clippers	10
Unit-V **Waveform Generator and Multivibrator**	5a. Explain concept of oscillators 5b. Develop and analyze different types of oscillators for desired frequency output using op-amp IC 741 5c. Develop multi-vibrators for given values using timer IC 555	5.1 Concept of oscillators, Types of oscillators: Phase shift oscillators, Wien bridge oscillators, Quadrature oscillator using IC-741. 5.2 Pulse generator. Square and triangular wave generators 5.3 Types of Multi-vibrators: Mono-stable, Astable, Bi-stable usingIC-555. Schmitt trigger, voltage controlled oscillator (VCO) Missing pulse generator, Mono-stable ramp generator, Free-running ramp generator using IC-555	12
Unit-VI **Active Filters and PLL**	6a. Distinguish between the different types of filters or classify filters 6b. Explain different parameters of filter and steps for designing filters 6c. Design, implement and interpret the different parameters from frequency response of the filter. 6d. Use the PLL in frequency related applications 6e. design and analyze different application using PLL IC 565	6.1 Concept of passive and active filters Merits and demerits of active filters over passive filters Ideal and actual characteristics, 6.2 terms: - cut off frequency, Pass band, Stop band, center frequency, roll off rate, BW, Q-factor, first order and second order Butterworth filters, order of filter, • Low pass filter, • high pass filter, • band pass filter (wide band pass, narrow band pass filter) • Band reject filter(wide band reject, narrow band reject filter) • All pass filter. • Numerical based on design of different filters	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		6.3 Basic principle of PLL with block diagram Transfer characteristics 6.4 Applications of PLL as frequency multiplier, FM Demodulator, Frequency translator, AM detector 6.5 Pin configuration of PLL IC 565 and its internal block diagram, Pin configuration of VCO IC 566, its internal block diagram	
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Operational amplifier	06	06	04	16
II	OP-AMP basic circuits	06	04	04	14
III	Applications of OP-AMP	04	04	04	12
IV	Comparators and detectors	04	04	04	12
V	Waveform generator and multivibrator	04	04	04	12
VI	Active filters and PLL	04	04	06	14
	TOTAL	**28**	**26**	**26**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

7.0 SUGGESTED EXERCISES/PRACTICALS

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hrs.
1	II	Assemble and test the Inverting amplifier or non inverting amplifier using IC741 and verify equation for gain. • Observe the output • verify the gain equation	04
2	II	Assemble and test adder or subtractor circuit using IC 741 • Observe the output • verify the gain equation	04
3	II	Assemble and test input and output waveforms of Differentiator using IC741 for following input	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hrs.
		• Sine waveform • Square waveform	
4		Assemble and test input and output waveforms of integrator using IC741 for following input • Sine waveform • Square waveform	04
5	IV	To Assemble and test Zero crossing detector Circuit using IC 741. • Observe Input and Output Waveform.	04
6	IV	Assemble and test circuit of Schmitt Trigger using IC741 • Determine upper threshold voltage(U_{TH}) and lower threshold voltages(L_{TH}) • determine hysteresis voltage($H_{Y)}$	04
7	III	Assemble and test Voltage to current converter using IC 741	04
8	III	Assemble and test current to Voltage converter using IC 741	04
9	III	Assemble and observe the waveform of Half wave and full wave precision rectifiers using IC 741	04
10	III	Assemble and test the waveform of Op-amp clippers	04
11	V	Design and test Wien bridge oscillator using IC 741 • Design and implement the circuit • Observe the output on CRO • Determine output frequency • Verify the design	04
12	V	Design and test phase shift oscillator using IC 741 • Design and implement the circuit • Observe the output on CRO • Determine output frequency • Verify the design	04
13	VI	Design and assembles Butterworth low pass filter/ high pass filter using IC 741 • Design and implement • Plot the frequency response • Determine its cut-off frequency • Verify the design	04
14	VI	Design and assembles Butterworth narrow band pass /band reject filter using IC 741 • Design and implement • Plot the frequency response • Determine its cut-off frequency • Verify the design	04
15	V	Design and test Astable multivibrator circuit using IC555 / IC 741 • Design and implement the circuit • Observe the output on CRO • Determine output frequency • Verify the design	04
16	V	Design and test Monostable multivibrator circuit using IC741 / IC 741 • Design and implement the circuit • Observe the output on CRO • Determine output frequency • Verify the design	04
		TOTAL	**64**

8.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare journals based on practical performed in linear integrated circuit laboratory.
2. Collect datasheets of different op-amp IC's
3. Collect the information related to different brands, make and specification of op amp
4. Assignments on the design of different circuits using op-amp and timer IC
5. Design, implement and verify any circuit using op-amp IC 741 OR timer IC 555 as a mini project
6. Collect information related to other linear IC like instrumentation amplifiers, VCO.
7. Prepare a comparative chart of different types of op- amp used in industrial purpose.
8. Collect information regarding different op-amp and timer IC application used in industries.
9. Prepare a report on above information related to industry.
10. Design and implement different circuit using any software like MULTISIM, CIRCUIT MAKER, LABVIEW or any analog simulation software.

9.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Arrange industrial visit.
2. Expert lecture from industrial experts OR academicians.
3. Show videos /power point presentation from renowned experts in the area of linear electronics stream.

10.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Linear Integrated circuits	Roy Choudhary and Jain	New age International Publishers ISBN No. 81-224-1470-2
2	Integrated Circuits	K. R. Botkar	Khanna Publisher, New Delhi ISBN No. 8174092080
3	Operational Amplifiers	Ramakant Gaikwad	Prentice-hall of India, New Delhi ISBN No. 0750656948
4	Operational Amplifiers	Graeme and Tobey	Prentice-hall of India, New Delhi ISBN No. 0770649170

B) Software/Learning Websites

Websites:

1. http://www.wisc-online.com
2. http://www.electronics-tutorials.ws/opamp
3. http://www.allaboutcircuits.com/
4. http://www.electronicdesign.com/
5. http://www.555-timer-circuits.com/
6. http://www.electroschematics.com/
7. http://www.radio-electronics.com/
8. www.futureelectronics.com
9. http://www.daenotes.com/

C) Major Equipments/ Instruments with Broad Specifications

1 DC Regulated dual Power supply.

1. O/P voltage – 0 to 30 Volt, 2A in 3 range in both channel
2. Display – 3 ½ digit,
3. Load regulation – 0.5 v % + 10mv, no load full load for each channel
4. Line regulation – 0.05 % + 15 mV for +/-, Variation around 230 volt
5. O/P imp – 15 milliohms,
6. Ripple – less than 1mv rms.
7. I/P supply – 230 V +/- 10 % 50 Hz.
8. Both channel tracking mode

2 Function generator 3MHz.

1. Out Put wave form – Sine, Triangle, Square.
2. Frequency range – 0.1 Hz to 3 MHz.
3. Amplitude Range – 30mv to 30 Volt P- P,
4. O/P impedance – 50 V.
5. offset capability,
6. Display – 4 digit LED/ LCD

3 Pulse Generator.

1. Pulse repetition rate – 0.1 Hz to 10 MHz in 8 decade ranges.
2. Rise and fall time – 10 ns - 2 ns
3. Pulse width – 35 ns and 0.1 µsec to 1 sec in y decade range
4. O/P – 40 mV to 5 V across 50 Ω in six step,
5. Power supply – 230 v +/- 10 % 50 Hz.

4 CRO

1. Dual Channel, 4 Trace CRT / TFT based
2. Bandwidth 20 MHz/30 MHz
3. X10 magnification 20 nS max sweep rate,
4. Alternate triggering 05) Component tester
5. Digital Read out0 7) USB interface
6. (Any other Oscilloscope with additional features are also suitable

11.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	H	H	M	H	M					
CO2	H	H	H	M	H	H					
CO3	M		H	H	H	M					
CO4	H		H	L	H	H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Analog Communication (ACO) **COURSE CODE :**6249

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

As an electronics and Telecommunication diploma engineer, students should have fundamental knowledge of various communication systems required for transmission and reception. Student should also learn generation, modulation, demodulation, transmission and reception of audio signals.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the principle of communication system.
2. Understand the concept of modulation and demodulation of AM and FM.
3. Understand different sections in AM and FM transmitters.
4. Understand different sections in AM and FM receivers.
5. Knows principles of radio wave propagation.
6. Understand different parameters of transmission line.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify different modulator and demodulator circuits.
2. Draw and describe operation of different modulator and demodulator circuits.
3. Analyze modulator and demodulator circuits.
4. Trace faults in radio receiver.
5. Name the different propagation methods.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Basics of Electronic Communication**	1a. Need of communication system. 1b. Define Analog, Digital, Baseband signal. 1c. Categorize different electronic communication system. 1d. Draw and explain the block diagram of communication system.	1.1 Importance, Definition: Analog signal, Digital signal, Baseband signal 1.2 Block diagram of electronic communication system 1.3 Types of electronic communication • Simplex • Duplex- Full and Half 1.4 Analog Communication System 1.5 Digital communication system 1.6 Application of communication 1.7 Electromagnetic spectrum, different bands and their frequencies. 1.8 Concept of transmission bandwidth	08
Unit-II	2a. Need and types of	2.1 Concept and need of modulation,	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Amplitude Modulation	modulation. 2b. Identify carrier, modulating signal, modulated signal and calculate modulation index. 2c. Draw circuit and explain operation of generation of AM and Balanced Modulator. 2d. Draw block diagram and explain working of AM transmitter and Suppression of Sideband.	types of modulation (AM, FM, PM) 2.2 Amplitude Modulation- definition, modulation index, power relations, representation in time and frequency domain. mathematical expression.(simple numerical) 2.3 Generation of AM: circuit diagram, description and waveforms of Class C collector modulator (collector modulation) 2.4 Block diagram and description of : Low level AM Transmitter and High level AM transmitter 2.5 Suppression of carrier: Balanced Modulator (using diode), Suppression of Sideband using filter method 2.6 Simple numerical on AM	
Unit-III **Frequency Modulation**	3a. Identify carrier, modulating signal, modulated signal and calculate bandwidth and deviation ratio. 3b. Draw and explain pre emphasis, de emphasis circuit. 3c. Describe Direct and Indirect method for FM generation. 3d. Draw block diagram and explain working of FM transmitter.	3.1 Frequency modulation: Definition, mathematical representation of FM, Frequency domain representation, Bandwidth, Deviation ratio, maximum deviation ratio. 3.2 Need of pre-emphasis and de-emphasis circuit: definition, diagram and working of circuitry. 3.3 Direct method for FM generation: circuit diagram and working of Transistorized reactance modulator, varactor diode modulator 3.4 Indirect method for FM generation: block diagram and description of Armstrong method 3.5 Block diagram and description of FM transmitter.	10
Unit-IV **AM and FM radio receiver**	4a. Categorize different types of radio receivers. 4b. Describe characteristics of radio receivers. 4c. State need of AGC 4d. Explain different radio receivers	4.1 Types of receivers TRF receiver, block diagram and its description, disadvantages 4.2 Super heterodyne receiver, block diagram and its description. Use of antenna in transmitter and receiver. 4.3 Advantages of RF section, definition and explanation of its characteristics: Sensitivity, Selectivity and Fidelity. 4.4 IF frequency concept and factors influencing choice of IF. 4.5 Circuit diagram and operation of IF amplifier circuit. 4.6 Circuit diagram and operation of diode detectors. 4.7 AGC : Necessity, concept and	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		characteristics of simple and Delayed AGC.	
Unit-V **Transmission Line**	5a. Explain the theory of transmission line 5b. Calculate characteristic impedance of transmission line. 5c. Define the terms standing wave, SWR, VSWR 5d. Analyze the properties of impedance matching stubs	5.1 Types of transmission lines 5.2 Equivalent circuit of a parallel wire line, their advantages and disadvantages. 5.3 Coaxial cable: construction advantages and disadvantages. 5.4 Characteristic impedance Losses in transmission line 5.5 Standing waves, SWR, VSWR and Reflection Coefficient 5.6 Transmission line components-single and double stub, balun	12
Unit-VI **Wave propagation**	6a. Explain the theory of electromagnetic radiation. 6b. State different types of wave propagation. 6c. Define the various atmospheric layers 6d. Define the terms maximum usable frequency, critical frequency, skip distance and fading.	6.1 Fundamentals of electromagnetic wave 6.2 Transverse electromagnetic waves, polarization. 6.3 Ground wave 6.4 Ionosphere 6.5 Sky wave propagation 6.6 Space wave propagation 6.7 Concept of virtual height and actual height. 6.8 Definition: Critical frequency, Maximum usable frequency, skip Distance, fading.	12
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Basics of Electronic communication	04	04	--	08
II	Amplitude Modulation	08	10	02	20
III	Frequency Modulation	02	08	02	12
IV	AM and FM radio receivers	06	10	02	18
V	Transmission Line	04	06	--	10
VI	Wave propagation	04	08	--	12
	TOTAL	**28**	**46**	**06**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Generate and observe AM wave and measure modulation index.	02
2	II	Generate and observe AM wave using Class C modulator	02
3	II	To obtain demodulated wave from AM wave.	02
4	II	To observe the DSB-SC wave form of balanced modulator using IC1496	02
5	III	Generate and observe FM wave.	02
6	III	Generate and observe FM wave by using reactance modulator.	02
7	III	Demodulate FM signal by using Ratio detector	02
8	IV	Trace and identify the super heterodyne radio receiver sections.	04
9	IV	Find out faults in radio receivers.	04
10	IV	Visit to Akashwani Kendra and study the recording and broadcasting techniques and prepare report.	04
11	IV	Find out sensitivity and selectivity of AM receiver.	04
12	V	Measure attenuation constant of the transmission line	02
TOTAL			**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Download different application based on electromagnetic spectrum.
2. Collect data about AM and FM frequencies from radio stations.
3. Collect the frequencies of different TV channels.
4. Collect the data about types of modulations used in different communication applications.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video to demonstrate the working principles, constructional features, testing and understandings of different types of modulations.
2. Arrange a visit to any radio station.
3. Arrange expert lecture of an industry person in the area of communication.
4. Arrange faulty electronic circuit and provide to students for repairing. (Case Study)
5. Encourage students to build communication circuits.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Electronics Communication System	George Kennedy	Tata McGraw-Hill, New Delhi
2	Electronics Communication	Roddy Collin	Prentice Hall India, , New Delhi
3	Electronics Communication System	Wayne Tomasi	Pearson Publications, New Delhi
4	Communication Electronics	Louis E Frenzel	TATA McGraw Hill, New Delhi
5	Telecommunication Principle circuits and systems.	S. Rambhadran	S. Chand Publication, New Delhi
6	Electronic communication	Sanjeev Gupta	Khanna Publications, New Delhi

B) Software/Learning Websites

1. http://www.nptel.com
2. www.circuitdiagram.net/am-radio-receiver.html
3. http://www.circuitdiagram.org/am-radio-receiver-with-mk484.html

C) Major Equipments/ Instruments with Broad Specifications

1. Cathode ray oscilloscope
2. Regulated power supply
3. CRO Probes and connecting wires
4. Experimental kit of AM Modulator and Demodulator
5. Experimental kit of FM Modulator and Demodulator
6. Experimental kit of super heterodyne receiver
7. Experimental kit of DSB-SC modulator using IC 1496
8. Experimental kit of AM Modulator

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	H	H	M	H	M					
CO2	H	H	H	M	H	H					
CO3	M		H	H	H	M					
CO4	H		H	L	H	H					
CO5	H	H	H	M	H	M					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Industrial Electronics and Applications (IEA) **COURSE CODE :**6250

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

To make students aware & familiar with faults, concepts and techniques of processes in the industrial electronics field. The techniques described in this course are used in all types Industries and in all engineering fields.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know operation and specifications of power devices
2. Understand operations like inversion, chopping and controlled rectification using power devices
3. Understand operation of different industrial control circuits
4. Use power devices to built a power circuit

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Select appropriate power devices required for an industrial application/ power circuit.
2. Assemble industrial/power electronic circuit.
3. Trace the fault in given circuit.
4. Identify faulty component in given industrial circuit/power circuit.
5. Infer from the output regarding probable faults in given circuit.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Thyristor family devices**	1a. Categorize different power electronic devices. 1b. Describe construction and operation of SCR, DIAC, TRIAC, Power MOSFET, SCS, SUS, SBS, LASCR, IGBT and GTO. 1c. List the applications of Power MOSFET, SCR, DIAC, TRIAC, SCS, SUS, SBS, LASCR, IGBT and GTO. 1d. Recognize different power devices. 1e. Need of series and parallel connection of SCRs. 1f. Circuit diagram and operation of series and parallel connection of SCRs.	1.1 Power Electronic Devices : Symbol, constructional diagram, operating principle, V-I characteristic, specifications and applications of SCR, DIAC, TRIAC, Power MOSFET, SCS, SUS, SBS, LASCR, IGBT and GTO. 1.2 Series and Parallel connection of SCRs 1.3 Static and dynamic equalizing circuits.	12
Unit-II	2a. Categorize Turn -ON and Turn	2.1 Principle of high voltage,	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Turn ON and Turn OFF methods of SCR	-OFF methods of SCR 2b. Draw circuit and explain operation of R, R-C and UJT as a relaxation mode triggering circuit. 2c. Describe the concept of high voltage, radiation, thermal and dv/dt triggering. 2d. Draw circuit and explain operation of class A, B, C, D, E and F commutation method.	radiation, thermal and dv/dt triggering. 2.2 Circuit diagram and operation of R, R-C and UJT triggering circuit. 2.3 Circuit diagram and operation of class A, B, C, D, E and F commutation method.	
Unit-III **Phase Controlled Rectifiers**	3a. Categorize different controlled rectifiers 3b. Explain with the help of a waveform, principle of phase control. 3c. Derive the expression for the output voltage of single phase controlled rectifier with R and R-L load. 3d. Draw circuit diagram and state the operation of single phase controlled rectifier with R and R-L load. 3e. Describe the effect of freewheeling diode. 3f. Draw circuit diagram and explain operation of three phase controlled rectifier with R and R-L load.	3.1 Classification of controlled rectifiers 3.2 Circuit diagram, operation and waveforms for output voltage of single phase half wave controlled rectifier with R and R-L load. 3.3 Circuit diagram, operation and waveforms for output voltage of single phase full wave rectifier with R and R-L load. 3.4 Circuit diagram, operation and wave-forms for output voltage of bridge rectifier with R and R-L load. 3.5 Circuit diagram and operation of three phase controlled rectifier with R and R-L load. 3.6 Effect of free- wheeling diode	10
Unit-IV **Inverters and Choppers**	4a. Describe the principle of inversion and state its need 4b. Categorize inverters. 4c. Draw the circuit diagram and explain the operation of single phase half bridge inverter 4d. Draw the circuit diagram and explain the operation of series inverter 4e. Draw the circuit diagram and explain the operation of parallel inverter 4f. Describe principle of operation of basic chopper. 4g. Draw the circuit diagram and explain the operation of step up and step down chopper. 4h. Compare inverter and chopper. 4i. State applications of inverters and choppers	4.1 Principle of inverter and its need 4.2 Classification of inverters 4.3 Circuit diagram and operation of single phase half bridge, series and parallel inverters 4.4 Operating principle of chopper 4.5 Circuit diagram and operation of step up and step down choppers. 4.6 Chopper configurations: Circuit diagram of single quadrant (Type A and B), Two quadrant (Type C and D) 4.7 Circuit diagram and operation of Jones Chopper	12
Unit-V	5a. Draw circuit diagram and explain operation of Light	5.1 circuit diagram and operation of Light dimmer, SCR flasher,	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Industrial Control Circuits and Applications	dimmer, SCR flasher, temperature controller, DC time delay relay, opto-coupler, batch counter and smoke detector 5b. Draw block diagram of online and offline UPS and explain it. 5c. Draw block diagram of SMPS and explain it.	temperature controller, DC time delay relay, opto-coupler, batch counter and smoke detector 5.2 Block diagram of online and offline UPS and their operation 5.3 Block diagram of SMPS	
Unit-VI **Speed Control of DC and AC Motors**	6a. Draw circuit diagram and explain operation of DC motor speed control using armature voltage control 6b. Draw circuit diagram and explain operation of speed control of induction motor using V/f method.	6.1 Circuit diagram and operation of DC motor speed control using SCR and armature voltage control method. 6.2 Circuit diagram and operation of speed control of induction motor using V/f method.	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	**U Level**	**A Level**	**Total Marks**
I	Thyristor family devices	08	04	04	16
II	Turn ON and Turn OFF methods of SCR	04	04	04	12
III	Phase controlled Rectifiers	04	04	04	12
IV	Inverters and Choppers	04	04	08	16
V	Industrial Control circuits and applications	08	--	08	16
VI	Speed control of DC and AC Motors	--	04	04	08
	TOTAL	**28**	**20**	**32**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Identify different power electronic devices.	04
2	I	Plot V-I characteristics of SCR and Diac/Triac	04
3	II	Assemble R triggering circuit on breadboard or PCB.	04
4	II	Assemble R-C triggering circuit on breadboard or PCB.	04
5	III	Assemble UJT relaxation oscillator triggering circuit on breadboard or PCB.	04
6	II	Assemble the circuit of Class C commutation method on breadboard or PCB.	04
7	III	Test and measure the output of single phase half wave controlled rectifier with R-L load on CRO.	04
8	III	Test and measure the output of single phase full wave controlled rectifier with R- load on CRO.	04
9	IV	Test and measure performance of series inverter circuit on experimental kit.	04
10	IV	Test and measure performance of step-up chopper	04
11	V	Assemble the circuit of light dimmer using Triac on breadboard or PCB.	04
12	V	Test and measure performance of DC time delay relay using SCR on experimental kit.	04
13	V	Test and measure performance of SMPS	04
14	V	Test and measure performance of UPS	04
15	VI	Measure the speed of a DC motor for different armature voltages using SCR.	04
16	VI	Test and measure performance of induction motor speed control circuit.	04
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Download data sheets of Power MOSFET, SCR, DIAC, TRIAC, SCS, SUS, SBS, LASCR, IGBT and GTO.
2. Collect data about prices, specifications, of power devices from local market.
3. Build R- triggering circuit for SCR.
4. Collect catalogues of AC and DC drives from market. Do comparative study.
5. Visit to UPS industry and collect data.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of power electronic devices and circuits.
2. Arrange a visit to process control industry which uses power electronic circuits.
3. Arrange expert lecture of an industry person in the area of industrial electronics.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Thyristor & its Applications	Ram Murty	PHI Learning
2	Power Electronics	P. C. Sen	Tata McGraw-Hill Education ISBN:0-07-462400-8
3	Power Electronics	M. D. Singh, K.	Tata McGraw-Hill Education (Second

Sr.No.	Title of Book	Author	Publication
		B. Khanchandani	Edition) ISBN:13-978-0-07-058389-4
4	Power Electronics	M. H. Rashid	PEARSON Education, (Second Edition) ISBN:13-978-0-12-068479-7
5	Power Electronics Devices Circuits and Applications	V. R. Moorthi	Oxford University Press ISBN:13-978-0-19-567092-9
6	Industrial Electronics	G. K. Mittal	Khanna Publication

B) Software/Learning Websites

1. http://www.powerguru.org/power-electronics-design-simulation-analysis-tools
2. http://powersimtech.com/products/psi

C) Major Equipments/ Instruments with Broad Specifications

1. Cathode ray oscilloscope
2. Regulated power supply
3. Power scope
4. V-I Characteristics of SCR – Experimental kit
5. SCR triggering using DC voltage – Experimental kit
6. SCR triggering using RC-network – Experimental kit
7. Commutation methods of SCR – Experimental kit
8. Single phase half controlled full wave rectifier with R-load– Experimental kit
9. Single phase half wave controlled rectifier with R- load – Experimental kit
10. Series Inverter– Experimental kit
11. Light dimmer – Experimental kit
12. Time delay relay using UJT and SCR.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	H	H	H	H	M					
CO2			H	H	H						
CO3			H	H	H						
CO4		H	H	H	H						
CO5	H		H		H						

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : C Programming (CPG) **COURSE CODE :** 6251

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

C is general purpose structural language that is powerful, efficient and compact, which combines features of high level language and low level language. It is closer to Man and Machine both. Due to this inherent flexibility and tolerance it is suitable for different development environments. Due to these powerful features C has not lost its importance and popularity in recently developed and advanced software industry. C can also be used for system level programming, C is still considered as first priority programming language.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Describe the concepts of constants, variables, data types and operators.
2. Develop programs using input and output operations.
3. Write programs using different looping and branching statements.
4. Write programs based on arrays and strings handling functions.
5. Write programs using user-defined functions, structures and union.
6. Apply knowledge pointer in C Programming.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain the concept of c.
2. Explain operators& data input and output functions
3. Implement and understand decision making and looping.
4. Explain concept of array and string.
5. Learn how to create a functions and structure. And understand the categories of function.
6. Implement the basic concept of pointers.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to C**	1a. Introduction and history of C 1b. Basics structure of c 1c. compilation and execution	1.1 History of C 1.2 Basics of Algorithm and Flowchart in C, Steps for executing a C program 1.3 Character set, tokens, constants, variables, keywords C operators, C expressions, data types in c, keywords, c Operators, declaration, constants. 1.4 Structure of C program, Rules for writing a C program 1.5 Compilation & Execution	08
Unit-II	2a. Operators 2b. Input and Output	2.1 Arithmetic Operators Assignment Operator 2.2 Unary operators	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Operators and I/O Library Functions	Library Functions	2.3 Relational & Logical Operators, 2.4 Conditional & Comma Operator 2.5 printf() 2.6 scanf() 2.7 getchar() 2.8 putchar() 2.9 gets() 2.10 puts()	
Unit-III **Decision Making**	3a. Basic of decision making and branching. 3b. loops	3.1 Decision making and branching 3.2 if Statement(if, if-else, if-else ladder, nested if-else) 3.3 Switch, break, continue, go-to statement 3.4 Decision making and looping 3.5 While, do – while, for Statements 3.6 Nested loops	10
Unit-IV **Arrays and Strings**	4a. basic of array 4b. basic of string	4.1 Declaration and initialization of one dimensional, two dimensional and character arrays, accessing array elements. 4.2 Declaration and initialization of string variables, string handling functions from standard library (strlen(), strcpy(), strcat(), strcmp()).	10
Unit-V **Functions and Structures**	5a. basic of functions 5b. basic of structures	5.1 Need of functions, scope and lifetime of variables, defining functions, function call (call by value, call by reference), return values, storage classes, Category of function (No argument No return value, No argument with return value, argument with return value), recursion. 5.2 Defining structure, declaring and accessing structure Members, initialization of structure, arrays of structure.	08
Unit-VI **Pointers**	6a. To learn basic of pointers 6b. Implement pointers by call by value and call by reference	6.1 Understanding pointers, declaring pointer variable, initialization of pointer variable, accessing address of a variable 6.2 Comparison of call by value & call by reference	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	**U Level**	**A and above Levels**	**Total Marks**
I	INTRODUCTION TO C	04	04	04	12
II	Operators and I/O Library Functions	05	10	05	20
III	Decision making	04	04	04	12
IV	Arrays and string	05	06	05	16
V	Functions and Structures	04	04	04	12
VI	Pointers	02	04	02	08
	TOTAL	**24**	**32**	**24**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Installation and study of Turbo C editor and draw Flowchart algorithm of simple program.	02
2	II	Program for standard I/O library functions	02
3	III	To find greatest/ smallest of 3 numbers. (use if, if else, nested if)	04
4	III	To find even or odd numbers.	02
5	III	Display menu 1. Addition 2. Subtraction 3. Multiplication 4. Division and execute it using switch case.	02
6	IV	To display all even numbers from 1-100.	02
7	IV	To find smallest / largest number from array elements	02
8	IV	To sort array elements in ascending order.	02
9	V	To enter elements for 3X3 matrix and display them.	04
10	V	To calculate addition of 2 dimensional matrix.	02
11	V	To calculate area of circle using function.	04
12	VI	program to access address of variable using pointer	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Visit industry to understand the c programming projects.
2. Prepare Seminar on File handling in C programming

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Demo lectures with power point presentations using LCD projector should be arranged to develop programming concepts of students.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Programming in 'C'	E. Balgurusamy	Tata McGraw Hill
2	Let us 'C'	Yashavant Kanetkar	BPB
3	Complete reference C	Herbert Shildt	Tata McGraw Hill
4	The C Programming Language	Brian Kernighan and Dennis Ritchie	Paperback

B) Software/Learning Websites

1. http://www.iu.hio.no/~mark/CTutorial/CTutorial.html
2. http://apex.vtc.com/c-programming.php
3. http://www.eskimo.com/~scs/cclass/cclass.html
4. http://www.cprogramming.com/tutorial/c/lesson1.Html

C) Major Equipments/ Instruments with Broad Specifications

Hardware Intel Pentium Processor N3700 (2M Cache, up to 2.40 GHz), Windows 10 Home 64bit English, 2GB (1x2GB) 1600MHz DDR3L Memory, 500GB 5400 rpm Hard Drive, 19.5-inch HD+ (1600 x 900) Anti-Glare LED-Backlit Display, 2GB (1x2GB) 1600MHz DDR3L Memory, 500GB 5400 rpm Hard Drive, Intel HD Graphics, Tray load DVD Drive (RW to DVD/CD), **Ports Side** 2 USB 3.0 **Rear** 2 USB 2.0, 45 – RJ 10/100/1000 Gigabit, Wireless Keyboard and Mouse-KM636 - US International (QWERTY) – Black, Wireless mouse included with Keyboard

Software Borland Turbo C Compiler/Editor

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	L	M	H								M
CO2	M	H	H	H					M		L
CO3	M	H	H	M					L		M
CO4	M	H	H	M					M		L
CO5	L	H	M	M					M		L
CO6	M	H	M	M					M		M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Applied Mathematics (AMT) **COURSE CODE** : 6301

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme			Examination Scheme									
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	00	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

The study of mathematics is necessary to develop in the students the skills essential for new technological development. This course introduces some applications of engineering, through which the students can understand mathematics with engineering principles.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Acquire knowledge of mathematical terms, concepts, principles and different methods.
2. Develop ability to apply mathematical method to solve engineering problems.
3. Acquire sufficient mathematical technique necessary for practical problems.
4. Apply the relation between mathematics and applications in engineering.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to solve engineering and applied mathematical problems using

1. Methods of integration
2. Definite integral and its application
3. Differential equation and its application
4. Numerical methods for solving algebraic and simultaneous equations
5. Laplace's transform.
6. Probability distribution.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Integration**	1a. Solve integration problem using rules and formulae 1b. Apply method of integration for solving problem	1.1 Definition of integration, integral as anti- derivative, integration of standard functions. 1.2 Rules of integration (Integral of sum or difference of functions, scalar multiplication) 1.3 Methods of integration. a. Integration by method of substitution & by using trigonometric transformation b. Integration of rational functions & by method of partial fraction c. Integration by parts	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Definite Integration And Its Application**	2a. Apply definite integration to solve engineering problems, area Volume and R.M.S. value.	2.1 Definite Integration a. Definition of definite integral b. Properties of definite integral with simple problems c. Application of definite integration Area under curve, area bounded by two curves. Volume generated by revolution of curve, RMS value & mean value.	08
Unit-III **Differential Equations**	3a. To form and solve Differential Equation 3b. Apply various method to solve differential equations 3c. Solve engineering problems using differential equation.	3.1 Definition of differential equation, order and degree of differential equation. Formation of differential equation for function containing single or double constants. 3.2 Solution of differential equations of first order and first degree such as a. Variable separable form b. Reducible to variable separable c. Homogeneous differential equation d. Linear differential equation e. Bernoulli's differential equation. 3.3 Applications of differential equations.	08
Unit-IV **Numerical Methods**	4a. Solve algebraic equations by using Bisection method and Newton Raphson Method 4b. Solve simultaneous Equations by using Gauss-Seidel method and Jacobi's method 4c. Apply Lagrange's interpolation formula and Newton forward interpolation formula	4.1 Solution of algebraic equations using iterative method a. Bisection method b. Newton-Raphson method. 4.2 Solution of simultaneous equations containing three unknowns – iterative methods a. Gauss-Seidel method b. Jacobi's method 4.3 Interpolation a. Lagrange's interpolation formula b. Newton's forward difference 4.4 Interpolation formula	08
Unit-V **Laplace transform**	5a. Acquire knowledge of Laplace transform and Inverse Laplace transform. 5b. Apply Laplace Transform to solve Differential Equations.	5.1 Definition of Laplace transform and standard formulae of Laplace transform 5.2 Properties of Laplace transform (linearity, first & second shifting, multiplication by t^n, division by t) 5.3 Inverse Laplace transform, using partial fraction 5.4 Laplace transform of derivatives 5.5 Application of Laplace transform for solving differential equation.	06
Unit-VI **Probability**	6a. Apply Binomial Distribution 6b. Apply Poisson's	6.1 Binomial distribution 6.2 Poisson's distribution 6.3 Normal distribution (simple examples)	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Distribution	Distribution 6c. Apply Normal Distribution		
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Integration	04	08	08	20
II	Definite Integration and its application	04	04	04	12
III	Differential Equations	04	08	04	16
IV	Numerical Methods	04	04	08	16
V	Laplace Transform	02	04	02	08
VI	Probability distribution.	02	04	02	08
	TOTAL	**20**	**32**	**28**	**80**

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Unit wise home assignment, containing ten problems.

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Teacher guided self learning activities.
2. Applications to solve identified Engineering problems and use of Internet.
3. Learn graphical software: Excel, DPlot, Graph etc.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Acceptable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mathematics for polytechnic student (III)	S. P. Deshpande	Pune Vidyarthi Gruha
2	Applied Mathematics	Kumbhojkar	Phadake Prakashan
3	Numerical Methods	S. S. Sastry	Prentice Hall Of India
4	Text book of Applied Mathematics, Volume I&II	P. N. Wartikar, J. N. Wartikar	Pune Vidyarthi Gruha Pune

B) Software/Learning Websites

1. http://www.mathsisfun.com/calculus/integration-definite.html
2. http://www.intmath.com/applications-integration/applications-integrals-intro.php
3. http://www.maths.surrey.ac.uk/explore/vithyaspages/differential.html
4. http://tutorial.math.lamar.edu/Classes/DE/LaplaceIntro.aspx
5. http://library2.lincoln.ac.nz/documents/Normal-Binomial-Poisson.pdf

C) Major Equipments/ Instruments with Broad Specifications

1. Scientific Calculator
2. Computer system with Printer and Internet system.
3. LCD Projector.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		M								L
CO2	H		M								L
CO3	H		M								L
CO4	H		M								L
CO5	H		M								L
CO6	H		M								L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE / DD / ID
COURSE : Environmental Studies (EVS) **COURSE CODE** : 6302

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	02	02	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Environment essentially comprises of our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by our callous deeds without any concern for the well being of our surrounding we are today facing a grave environmental crisis.

It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could be possible remedies or precautions which need to be taken to protect the environment.

The curriculum covers the aspects about environment such as Environment and Ecology, Environmental impacts on human activities, Water resources and water quality, Mineral resources and mining, forests.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand and realize nature of the environment, its components and inter-relationship between man and environment.
2. Understand the relevance and importance of the natural resources in the sustainability of life on earth and living standard.
3. Comprehend the importance of ecosystem and biodiversity.
4. Identify different types of environmental pollution and control measures.
5. Correlate the exploitation and utilization of conventional and non-conventional resources.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain uses of resources, their overexploitation and importance for environment
2. Describe major ecosystem
3. Suggest measurers for conservation of biodiversity
4. Identify measures for prevention of environmental pollution
5. Describe methods of water management
6. Identify effects of Climate Change, Global warming, Acid rain and Ozone layer
7. Explain Concept of Carbon Credits
8. State important provisions of acts related to environment

4.0 COURSE DETAILS:

There are no separate classes for theory. The relevant theory has to be discussed before the practical during the practical sessions.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Importance of Environmental Studies**	1a. Define the terms related to Environmental Studies 1b. State importance of awareness about environment	1.1 Definition, Scope and Importance of the environmental studies 1.2 Need for creating public awareness about environmental issues
Unit-II **Natural Resources**	2a. Define natural resources 2b. Identify uses of natural resources, their overexploitation and importance for environment	2.1 Uses of natural resources, overexploitation of resources and importance for environment 2.2 Renewable and Non-renewable resources 2.3 Forest Resources 2.4 Water Resources 2.5 Mineral Resource 2.6 Food Resources
Unit-III **Ecosystems**	3a. Define Ecosystem 3b. List functions of ecosystem 3c. Describe major ecosystem in world	3.1 Concept of Ecosystem 3.2 Structure and functions of ecosystem 3.3 Major ecosystems in the world
Unit-IV **Biodiversity and its Conservation**	4a. Define biodiversity 4b. State levels of biodiversity 4c. Suggest measurers for conservation of biodiversity	4.1 Definition of Biodiversity 4.2 Levels of biodiversity 4.3 Threats to biodiversity 4.4 Conservation of biodiversity
Unit-V **Environmental Pollution**	5a. Classify different types of pollution 5b. Enlist sources of pollution 5c. State effect of pollution 5d. Identify measures for prevention of pollution	5.1 Definition, Classification, sources, effects and prevention of • Air pollution • Water Pollution • Soil Pollution • Noise Pollution 5.2 E- waste management
Unit-VI **Social Issues and Environment**	6a. Describe methods of water management 6b. Identify effects of Climate Change, Global warming, Acid rain and Ozone Layer 6c. Explain Concept of Carbon Credits	6.1 Concept of sustainable development 6.2 Water conservation, Watershed management. Rain water harvesting: Definition, Methods and Benefits. 6.3 Climate Change, Global warming, Acid rain, Ozone Layer Depletion, 6.4 Concept of Carbon Credits and its advantages
Unit-VII **Environmental Protection**	7a. State important provisions of acts related to environment	7.1 Importance of the following acts and their provisions: • Environmental Protection Act • Air (Prevention and Control of Pollution) Act • Water (Prevention and Control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • Population Growth: Aspects, importance and effect on environment • Human Health and Human Rights • ISO 14000

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

SR. No.	Unit No.	Practical Exercises	Approx. Hrs. required
1	I	Report on Importance and public awareness of Environmental Studies.	04
2	II	Report on Use of natural resources and overexploitation of Resources	04
3	II	Visit /Video Demonstration to Renewable / Non-renewable (wind mill, hydropower station, thermal power station)/ resources of energy.	04
4	II	Visit to polyhouse and writing report on its Effects on agriculture food production.	04
5	III	Assignment/Report on structure and functions of ecosystem.	04
6	IV	Visit to a local area to environmental assets such as river / forest / grassland / hill / mountain and writing report on it.	04
7	V	Group discussion on Environmental Pollution (Air pollution/Water pollution/Soil pollution/Noise pollution/E-waste)	04
8	V	Visit to study recycling of plastic and writing a report on it.	04
9	VI	Visit to Water conservation site / Watershed management site / Rain water harvesting site and writing a report on it.	04
10	VI	Visit to study organic farming/Vermiculture/biogas plant and writing a report on it.	04
11	VI	Video Demonstration /Expert Lecture Report on Climate Change and Global warming	04
12	VII	Write important provisions of Acts related to Environment/ Air (Prevention and Control of Pollution) Act/Water (Prevention and Control of Pollution) Act/ Wildlife Protection Act/ Forest Conservation Act	04
		TOTAL	**32**

Note: Any Four Visits/ Video Demonstration and Four Reports/Assignments from above list to be conducted.

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1) Collect articles regarding Global Warming, Climate Change
2) Collect information regarding current techniques, materials etc. in environmental system.
3) Tree plantation and maintenance of trees in the Campus.
4) Cleanliness initiative (Swachhata Abhiayan)

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Course Video
2. Expert Lectures

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Environmental Studies	Erach Bharucha	Universities Press (India) Private Ltd, Hyderabad
2	Environmental Studies	Dr. Suresh K Dhameja	S K Kataria & Sons New Delhi
3	Basics of Environmental Studies	U K Khare	Tata McGraw Hill

B) Software/Learning Websites

Not Applicable

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	M			M	H					M
CO2	H	M			M	H					M
CO3	H	M	M		M	H			M		M
CO4	H	M		M	M	H		M		M	M
CO5	H	M			M	H					M
CO6	H	M			M	H	M				M
CO7	H	M			M	H					M
CO8	H	M			M	H					M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in ME / PS / EE / IF / CM / EL / AE / DD
COURSE : Industrial Organization and Management (IOM) **COURSE CODE** : 6303

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

Diploma engineer has to work in organization. One must know how organization works, structure of organization, departments & their roles in organization. One should be familiar with concept of organization & its importance in management.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the concepts of organization.
2. Resolve the major challenges in the design of an effective organizational structure.
3. Develop critical thinking, research, oral and written communication skills.
4. Promote an understanding to create organizational values and satisfy their stakeholders.
5. Know the preventive measures for accidents and safety.
6. Apply the various tools for scientific management.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify the organization and its types with ownerships.
2. State the principles of management with different levels.
3. Describe the types of accidents and its measures.
4. Work as a production supervisor and store officer.
5. Co-ordinate the functions of HRM and Marketing departments.
6. Use the practices of CPM/PERT and Supply Chain Management.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Organization and Ownerships**	1a. Describe organization and its types 1b. State various types of ownership firms	**a. Organization** 1.1 Concept of organization 1.2 Types of organization structures as line, line and staff, functional organizational structures, their merits and demerits. **b. Ownerships** 1.3 Proprietorship 1.4 Partnership, Types of partners, Partnership deed. 1.5 Joint stock companies, Private Limited, Public Limited, Joint Ventures. 1.6 Govt. departments, Govt. undertaking, Public corporation 1.7 Cooperative Organizations 1.8 Merits & demerits of all above mentioned types of ownership.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Scientific Management**	2a. Explain functions of scientific management 2b. State the principles of management. 2c. Describe different levels of management.	**Scientific Management** 2.1 Concept and importance of scientific management. 2.2 Principles of Management, Taylor, Fayol's Theories of management. 2.3 Functions of Management, Levels of Management and skills at different levels	06
Unit-III **Industrial Developments in India and Industrial Acts**	3a. Explain the major areas of Indian industries 3b. Describe types of accidents & safety measures 3c. State provisions of industrial acts.	**a. Industrial Developments in India** 3.1 Major areas of industry in India (Automobile, Cement, Steel and Agro industries) 3.2 Introduction of WTO and GATT **b. Industrial Acts** 3.3 Safety Management • Causes of accidents • Types of Industrial Accidents • Preventive measures • Safety procedures 3.4 Industrial Legislation - Necessity of Acts, Provisions of following acts: • Indian Factory Act • Workman Compensation Act • ▪ Minimum Wages Act	08
Unit-IV **Production and Material Management**	4a. Explain the types of production systems 4b. Describe the material management techniques 4c. State use of ERP and MRP	**a. Production Management** 4.1 Concept of production management 4.2 Types of production systems – job, batch and mass 4.3 Merits and demerits of all above production systems **b. Material Management** 4.4 Inventory Concept, its classification, functions of inventory 4.5 ABC Analysis - Necessity & Steps 4.6 Economic Order Quantity Concept, graphical representation, determination of EOQ 4.7 Standard steps in Purchasing 4.8 Modern Techniques of Material Management- JIT, KANBAN, VSM, LEAN. 4.9 Material Resource Planning (MRP) - Functions of MRP, Input to MRP, Benefits of MRP 4.10 Enterprise Resource Planning (ERP) - Concept, advantages & disadvantages of ERP	10
Unit-V **Marketing and Human Resource Management**	5a. Explain the functions of marketing management 5b. Describe selection procedure by HRM	**a. Marketing Management** 5.1 Concept of marketing management and importance 5.2 Functions of marketing promotion of sales, market segmentation, marketing mix, 4P's and Physical distribution.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	dept. 5c. Importance of Employee training	**b. Human Resource Management** 5.3 Recruitment selection procedure, Functions of HRM Dept. 5.4 Training of human resources- objectives, importance and methods of training	
Unit-VI **CPM/PERT and Supply Chain Management**	6a. Explain the importance of CPM/PERT 6b. Describe the need of SCM in industry	**a. CPM/PERT** 6.1 CPM & PERT – definitions of node, activity, dummy activity, resources, duration, network, earliest start time, earliest finish time, latest start time, latest finish time, float. 6.2 Drawing of network and determination of critical path. 6.3 Analysis of network. **b. Supply Chain Management** 6.4 Definition and Concept of SCM 6.5 SCM practices- Relational, Vendor Managed Inventory (VMI), Agile Manufacturing and Postponement. 6.6 Green SCM 6.7 Concept of cross docking 6.8 Case study of Wall Mart and Dell Computer	08
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	a. Organization	--	04	--	04
	b. Ownerships	02	04	--	06
II	Scientific Management	02	04	02	08
III	a. Industrial Developments in India	02	04	--	06
	b. Industrial Acts	04	04	--	08
IV	a. Production Management	02	04	02	08
	b. Material Management	02	04	02	08
V	a. Marketing Management	--	08	--	08
	b. Human Resource Management	02	06	--	08
VI	a. CPM/PERT	02	02	04	08
	b. Supply Chain Management	02	02	04	08
	TOTAL	**20**	**46**	**14**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect the organization structures of manufacturing, cement, pharmacy, electrical, govt. Sectors.
2. Find out the information of above mentioned industries by internet.
3. Collect the rules of industrial acts by ILO websites.
4. Gather information about chain structures of material management by logistics' industries.
5. Collect the information about WTO and GATT by online resources.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (IF ANY):

1. Show organization structures of different industries, govt. sectors, private firms etc.
2. Arrange a visit to industries, govt. offices located at nearby areas.
3. Arrange expert seminar/lectures by a resource person from industry in the area of manufacturing, HRM, Logistics etc.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Industrial Engineering & Management	Dr. O. P. Khanna	Dhanpat Rai & Sons New Delhi
2	Industrial Engineering & Management	Banga & Sharma	Khanna Publication
3	Business Administration & Management	Dr. S. C. Saksena	Sahitya Bhavan Agra
4	The process of Management	W. H. Newman E. Kirby Warren Andrew R. McGill	Prentice- Hall
5	Entrepreneurship Development & Management	Dr. R. K. Singal	S. K. Kataria & Sons, New Delhi
6	Production Planning & Control	Dr. R. K. Singal	S. K. Kataria & Sons, New Delhi

B) Software/Learning Websites

1. http://www.wto.org/
2. http://www.gatt.org/
3. http://www.worldtradelaw.net/
4. http://www.supplychainbrain.com/
5. http://www.legallyindia.com/

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1				M							
CO2					L		M				
CO3		M					L				
CO4	L					H					
CO5				L							L
CO6							M				

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Supervisory Skills (SSL) **COURSE CODE** : 6305

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

A diploma engineer working in the industry has to co-ordinate and supervises a group of workers. An engineer should have a leadership attitude. This course will help to develop requisite traits in the diploma engineer.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand importance of scientific management.
2. Understand the controlling performance of process & people.
3. Know organizing, staffing and training of worker.
4. Understand the importance of leadership.
5. Know industrial psychology and human relation.
6. Know safety awareness and health administration in the industry.
7. Understand role of supervisor in industry.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain the importance of scientific management.
2. Describe controlling performance of process & team of worker.
3. Explain the methods to train the worker.
4. State the qualities of leader.
5. Describe progressive disciplinary action to worker.
6. Enlist causes of accident and prevention of accident.
7. Explain the role of supervisor towards management and worker.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Scientific Management and Management of Job**	1a. Define the term management. 1b. Differentiate between management, administration and organisation. 1c. Explain the necessity and steps of scientific management. 1d. Describe handling complexity and its steps.	1.1 Management-definition, its job, Difference between management, administration and organization. Levels and its functions of management. 1.2 Definition, Necessity and, procedure of scientific management 1.3 Handling complexity and its steps. 1.4 Optimization and its steps.	06
Unit-II	2a. Explain objective of	2.1 Planning by supervisor, necessity,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Supervisory Management	planning by supervisory 2b. Describe the different types of budget. 2c. Explain the controlling of performance of team of worker in term of quantity & cost.	steps and objectives 2.2 Budgeting at supervisory level, objective and its advantages. Types of budget. 2.3 Deciding mental & physical activities of workers. 2.4 Controlling the performance of process & team of worker in term of quantity / quality/ time/ cost.	
Unit-III **Organising, Staffing and Training.**	3a. Define organising. 3b. State physical resources needed for production. 3c. Explain staffing with human resources. 3d. Define Merit rating. 3e. Explain methods of merit rating. 3f. Describe needs & objectives of training. 3g. List types of training. 3h. Explain types of training.	3.1 Organizing effectively the department, provision of physical resources, matching human need with job need, allotment of to individual and establishing relationship among person working in a group. 3.2 Staffing with the human Resources. 3.3 Appraisal of Employee performance or merit rating and its types. 3.4 Training-definition, needs and objectives its types –induction and orientation, by skill & old worker, on job training, apprentice training, by special schools.	06
Unit-IV **Activating the Work Force**	4a. Define-Motivation. 4b. Explain the motivating factors. 4c. State qualities of leader. 4d. Explain democratic leadership. 4e. Explain need of effective communication.	4.1 Motivation –definition, types and motivating factors. 4.2 Leadership-definition, qualities of leader, Role of leadership, methods-authoritarian, democratic and lassez- faire or free rein. 4.3 Effective employee communication.	08
Unit-V **Managing Problem Performance**	5a. State symptoms of troubled employee. 5b. Explain causes of industrial dispute. 5c. Describe collective bargaining. 5d. State the causes of substandard performance. 5e. Explain progressive disciplinary action.	5.1 Counselling troubled employees-symptoms, need and guidelines for counselling. 5.2 Industrial dispute-causes, strikes, settlement of industrial dispute, collective bargaining, conciliation & mediation and arbitration. 5.3 Disciplining-definition, Substandard performance, progressive disciplinary action.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-VI **Employee Health and Safety under OSHA**	6a. Define accident. 6b. List causes of accident. 6c. Explain the effect of accident to industry, worker and society. 6d. Describe role of OSHA	6.1 Accident-definition, Causes of accident, Prevention of accident, effect of accident to industry, worker and society, Preparation of accident report and investigation. 6.2 Occupational diseases, hazards, safety awareness. 6.3 Role of OSHA. (Occupational safety & health administration), industrial health.	06
Unit-VII **Supervisor's Role in Labour Relation.**	7a. Explain role of supervisor towards management and work. 7b. Describe function of labour union.	7.1 Role of supervisor in management/ worker/fellow Supervisor/work. 7.2 Labour or trade union-function, right and liabilities.	04
Unit-VIII **Moving up in your Organisation**	8a. Explain activities to be done at end of shift by supervisor. 8b. Describe sort of attitude and action by supervisor while moving up in organization.	8.1 Taking charge of career to know organization, Department & Worker etc. Planning the day work, activities to be done before shift start, beginning, during and end of shift. 8.2 Moving up –sort of attitude and action by supervisor	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Scientific Management and Management of Job	04	04	04	12
II	Supervisory Management	04	04	04	12
III	Organizing, staffing and Training.	04	06	--	10
IV	Activating the work force.	06	04	--	10
V	Managing problem performance.	04	04	04	12
VI	Employee Health and safety under OSHA	04	02	04	10
VII	Supervisor's role in Labour Relation.	--	06	-	06
VIII	Moving up in your organisation.	04	04	--	08
	TOTAL	**30**	**34**	**16**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare safety charts and slogan.
2. Exhibition of safety charts and slogan.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video clips on management and motivation.
2. Arrange expert lecture of industry person in the area of safety awareness in industry.
3. Show video clip on safety in industry.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Industrial Engineering and management	O. P. Khanna	Dhanpat Rai & Sons
2	Industrial organization & Engineering Economics	Banga & Sharma	Khanna Publication
3	Industrial management	Shrinivasan	Dhanpat Rai & Sons

B) Software/Learning Websites

1. http://www.management.com
2. www.safety.com

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	M			H					M		M
CO2			H	M			L	M	M		
CO3		M	H	M			M		M		M
CO4	H		M			H			M		M
CO5		M			M		M		M		
CO6		M			M		M		M		M
CO7				M	M	M	M	M	M		

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Marketing Management (MKM) **COURSE CODE** : 6306

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

The Marketing of product is the most important aspect of each industry. It needs to be systematically surveyed and planned as in the increasing competitive situation. An organization should have a profit for its existence. An engineer as entrepreneur, marketing set up of a company should have knowledge of marketing management. The job opportunities for an engineer in the marketing are increasing due to essentiality of person to deal the technical matter and give related feedback for improvement of product marketing function.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand various elements of market survey and design its methodology.
2. Understand the duties of marketing personal.
3. Learn the concept of pricing, branding, product mix etc.
4. Understand various marketing strategies.
5. Study various sales Forecasting methods and product diversification.
6. Acquire knowledge of various tools/techniques of Market research and product promotion.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Assess market opportunities by analyzing customers, competitors, collaborators, considering strengths and weaknesses of a company.
2. Develop effective marketing strategies to achieve organizational objectives.
3. Design a strategy implementation program to maximize its chance of success.
4. Assess scope for international marketing.
5. Use various tools/techniques of Market research and product promotion.
6. Apply various innovative ideas of advertisement for enhancing the sales.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Marketing Management Concept**	1a. Explain the needs, wants and demands of customers. 1b. Describe the concept of marketing management. 1c. Explain the functions of marketing management.	1.1 Needs, wants and Demands, Types of market demands, Products (Goods, services and Ideas), cost and satisfaction. 1.2 Markets, Marketers and prospects, primary purpose of marketing management. 1.3 Simple marketing system, value exchange and transaction, functions of marketing.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1d. Differentiate between selling and marketing. 1e. Explain the techniques of maximizing, consumption, customer choice and satisfaction. 1f. Distinguish between macro and micro environment. 1g. Explain techniques of maximizing consumer satisfaction, choice, product life etc.	1.4 The product, production and selling concept. 1.5 The marketing concept, difference between marketing and selling, the social marketing concept. 1.6 Maximize consumption, satisfaction, choice, product life, quality, customer value and consumer satisfaction, Customer – delight, life time customer. 1.7 Marketing environment – value, macro and micro environment.	
Unit-II **Marketing Management Process**	2a. Explain various types of market segmentation. 2b. Explain product life cycle. 2c. Describe 4P's of marketing. 2d. Explain the significance of different techniques in product promotion. 2e. Differentiate between Direct and Indirect marketing.	2.1 Market segmentation: Basis for segmentation- Geographic / Demographic / psychographic segmentations, benefits of Market segmentation. 2.2 Product: Concept of Product, New product development process. 2.3 Product Life cycle, Stages in PLC and Marketing Strategies. 2.4 Marketing mix: 4 P's, significance of 4P's. 2.5 Methods of marketing- Direct and Mass marketing. 2.6 Product promotion- Role of advertisement, personnel selling and internet in marketing promotion, mail marketing.	08
Unit-III **Price Decisions**	3a. Explain the significance of pricing in marketing management. 3b. Describe the different pricing methodologies.	3.1 Importance of pricing, price setting in practice 3.2 Cost oriented pricing- mark-up pricing, target pricing. 3.3 Demand oriented pricing, price discrimination. 3.4 Competition oriented pricing- going rate pricing, sealed bid pricing.	06
Unit-IV **Marketing Research**	4a. Explain the concept, scope, objectives, importance and limitation of market research. 4b. Explain various methods of data collection. 4c. Describe the market research tools and techniques. 4d. Differentiate between primary data and secondary data.	4.1 Market research – Introduction, Nature, Scope, objective, importance, limitations and issue formulation. 4.2 Source and collection of marketing data- primary data, secondary data. 4.3 Methods of collection of primary data- observation, mail, personal interview, television etc. 4.4 Market Research Techniques- National Readership survey, consumer panel, test marketing.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-V **Advertising and sales management**	5a. Explain the concepts of marketing communication. 5b. Explain the different types of sales promotions. 5c. Describe the concepts of sales management. 5d. Describe the various types of advertising media.	5.1 Concept and the process of marketing communication. 5.2 Concept of Sales promotion and its types. 5.3 Advertising media – objectives and functions, Types of media, advertising budget, functions of advertising agency. 5.4 Sales management: Concept, objectives, sales forecasting. 5.5 Personnel selling- concept, salesmanship, qualities of salesman.	08
Unit-VI **Strategic marketing**	6a. Describe the concepts of strategic marketing management. 6b. Explain the concept of Strategic marketing	6.1 Objectives and concept of strategic marketing management, 6.2 Strategic marketing Analysis-SWOT Analysis, BCG Matrix.	04
Unit-VII **International and Export marketing**	7a. Explain the concept, scope, opportunities and challenges of international marketing. 7b. Describe the Multi-National Enterprises with examples. 7c. Explain the role of Indian Trade Promotion Organization. 7d. State and explain the benefits to exporters.	7.1 Concept, scope, challenges and opportunities in international marketing. 7.2 Foreign market entry strategies. 7.3 Concept of Multi-National Enterprises (MNE) with examples. 7.4 Institutional support from government to promote export. 7.5 Role of I.T.P.O. (Indian Trade Promotion Organization) 7.6 Benefits offered to exporters by Central government.	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Marketing Management concept	06	08	--	14
II	Marketing Management Process	04	08	04	16
III	Price Decisions	04	04	--	08
IV	Marketing Research	04	04	04	12
V	Advertising and sales management	04	08	04	16
VI	Strategic marketing	02	04	--	06
VII	International marketing – Export	02	02	04	08
	TOTAL	**26**	**38**	**16**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Group discussion on Brand Strategies of any one company.
2. Assignment / Report writing on:
   (a) Distribution strategy of any one company.
   (b) Promotional tools (communication mix) adopted by any one company.
   (c) Comparative advertising strategies of any two companies.
   (d) Sales promotions offered by FMCG companies/brands (Minimum two companies/brands).

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not applicable

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Introduction to Marketing science	Lal G. K.	Pearson edition international
2	Marketing	Dale Timge	Prentice hall
3	Marketing Engineering	Lillen Gary	Pearson edition international
4	Marketing Management	Phillip Kolter	Pearson edition international
5	Modern Marketing Management	Francis G. K.	S. Chand & Company
6	Advertising Marketing Sales Management	Thakur D.	D&D Publication
7	Marketing Management	Mr. S. A. Sherlekar	Everest Publications.
8	How to Export	NABHI	NABHI Publication

B) Software/Learning Websites

1. http://www.business-standard.com/
2. http://studymarketing.org/
3. http://salesandmarketing.com/

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1				L			M	H	M	L	
CO2					H			H	H	H	
CO3			M	M	M		M	M	L		
CO4					M		H	L	M		
CO5					L		L	M	M	M	H
CO6			L	M	M	M	L	H	H	H	L

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE / DD / ID
COURSE : Entrepreneurship Development (EDP) **COURSE CODE :** 6309

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. On the global scenario we have abundant physical and human resources which emphasizes the importance and need of entrepreneurship. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white- collar jobs. This course will help in developing the awareness and interest in entrepreneurship and create employment for others.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Identify entrepreneurial opportunity.
2. Develop entrepreneurial personality, skills, values and attitude.
3. Analyze business ideas- project selection.
4. Develop awareness about enterprise management.
5. Take help of support systems like banks, Government, DIC etc.
6. Prepare preliminary project report.

3.0 COURSE OUTCOMES::-

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Develop Entrepreneurial skill by brainstorming games, SWOT analysis, Risk taking games
2. Collect information by Visiting to DIC and Nationalised Banks
3. Interview of successful entrepreneur
4. Learn the success stories from successful entrepreneur.
5. Select product after market survey for product comparison, specifications and feasibility study
6. Prepare preliminary project report

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Entrepreneurship, Creativity and Opportunities**	1a. Conduct self analysis 1b. Overview of Entrepreneurship	1.1 Concept, Classification & Characteristics of an Entrepreneur	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1c. Generating business idea 1d. Search business opportunities	1.2 Creativity and Risk taking. 1.3 Concept of Creativity, brainstorming Risk Situation, Types of risk & risk takers. 1.4 Trade Related opportunities 1.5 Business Idea -Methods and techniques to generate business idea. 1.6 Transforming Ideas in to opportunities 1.7 SWOT Analysis 1.8 Scanning Business Environment	
Unit-II **Business Terminology, Information and Support Systems**	2a. Understand Classification of business sectors 2b. Acquiring help from support systems 2c. Planning of business activities	2.1 Types of business and industries, forms of ownership, Franchisee, Export, Network/Multilevel Marketing 2.2 Sources of Information. Information related to project, support system, procedures and formalities 2.3 Support Systems 1. Small Scale Business Planning, Requirements. 2. Statutory Requirements and Agencies. 3. Taxes and Acts	02
Unit-III **Market Assessment**	3a. Conducting Market survey 3b. Selection of product	3.1 Marketing - Concept and Importance 3.2 Market Identification, Survey Key components 3.3 Market Assessment	02
Unit-IV **Business Finance**	4a. Understanding terminology of finance 4b. Search and analyse sources of finance 4c. Financial ratio and profitability study	4.1 Cost of Project 4.2 Sources of Finance 4.3 Assessment of working capital 4.4 Product costing 4.5 Profitability 4.6 Break Even Analysis 4.7 Financial Ratios and Significance 4.8 Various govt. /bank schemes of finance (long term and short term)	04
Unit-V **Business Plan and Project Appraisal**	5a. Prepare a project report. 5b. Conduct feasibility study.	5.1 Preliminary project report preparation. 5.2 Project Appraisal & Selection Techniques • Meaning and definition • Technical, Economic feasibility • Cost benefit Analysis • Checklist	04
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Entrepreneurship Awareness- Who am I?/ EOI/ Micro lab Exercise	04
2	I	Creativity Exercises/games	02
3	I	Risk taking Exercises/games	02
4	II	Brainstorming/group discussion/problem solving exercises	04
5	III	Business Games and Related Exercises	04
6	II	Interview of an entrepreneur	02
7	IV	Event/task/activity management-group of 4-6 students will work together	04
		AND/OR	
1 to 7	I-IV	3 day Achievement Motivation Training workshop /Entrepreneurship Awareness Program	22
8	V	Visit to DIC/Bank/MSSIDC/MIDC/MPCB/Industry	04
9	V	Prepare a preliminary project report and study its feasibility	06
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Assess yourself – are you an entrepreneur? (Self Analysis)
2. Report on
   - Interview of successful entrepreneurs (minimum two)
   - Interaction with the support systems
   - Visit to small scale industry
3. Product survey - select one product and collect all its related information i.e. specification, price, manufacturer from at least three suppliers/ manufacturers
4. Prepare list of identified opportunities

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Conduct 3 days awareness camp for entrepreneurship by professional bodies
2. Arrange a visit to SSI/DIC
3. Arrange Interview / Expert lecture of an entrepreneur

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Entrepreneurship Development	E. Gorden K. Natrajan	Himalaya Publishing, Mumbai
2	Entrepreneurship Development	Colombo plan staff college	Tata McGraw Hill Publishing Co. Ltd. New Delhi.
3	A Manual on How to Prepare a Project Report	J. B. Patel D. G. Allampally	EDI STUDY MATERIAL Ahmadabad
4	A Manual on Business Opportunity	J. B. Patel	

Sr.No.	Title of Book	Author	Publication
	Identification & Selection	S. S. Modi	
5	National Directory of Entrepreneur Motivator & Resource Persons.	S. B. Sareen H. Anil Kumar	
6	A Handbook of New Entrepreneurs	P. C. Jain	
7	The Seven Business Crisis & How to Beat Them.	V. G. Patel	
8	Entrepreneurship Development of Small Business Enterprises	Poornima M. Charantimath	Pearson Education, New Delhi
9	Entrepreneurship Development	Vasant Desai	Himalaya Publishing, Mumbai
10	Entrepreneurship Theory and Practice	J. S. Saini B. S. Rathore	Wheeler Publisher, New Delhi
11	Entrepreneurship Development	--	TTTI, Bhopal / Chandigarh
12	Entrepreneurship Management	Aruna Kaulgad	Vikas Publication

B) Software/Learning Websites

Websites-

1. http://www.ediindia.ac.in
2. http://www.dcmsme.gov.in/
3. http://www.udyogaadhaar.gov.in
4. www.smallindustryindia.com
5. www.sidbi.com
6. www.tifac.org.in

C) Video Cassettes /CDs

Sr. No.	SUBJECT	SOURCE
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat, Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428, Gujarat, India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in olpe@ediindia.org Website : http://www.ediindia.org
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entrepreneur skill	
6	Chhoo Lenge Aasman	
7	Creativity	

D) Major Equipments/ Instruments with Broad Specifications

Not applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1			L				L	M			M
CO2					M		M	H	M	M	H
CO3					L		M	L	H	L	M
CO4					L	M	M	M	M	H	M
CO5					H	M	M	H	H	M	M
CO6	L	M	M	M	M	M	H	H	M	H	H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in CE / PS / EE / EL / AE
COURSE : Renewable Energy Sources (RES) **COURSE CODE** : 6310

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	

1.0 RATIONALE:

Modern society relies on stable, readily available energy supplies. Renewable energy is an increasingly important component of the new energy mix. The course covers energy conversion, utilization and storage for renewable technologies such as wind, solar, biomass, fuel cells and hybrid systems. Thermodynamics concepts (including the first and second law) form the basis for modelling the renewable energy systems. The course also touches the environmental consequences of energy conversion and how renewable energy can reduce air pollution and global climate change.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. List various sources of energy and their applications in India and around the world.
2. Describe the challenges and problems associated with the use of various energy sources, with regard to future supply and the environment.
3. Determine potential solutions to the supply and environmental issues associated with energy sources.
4. Understand Emerging Energy Technologies.
5. Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

3.0 COURSE OUTCOMES:

The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Enlist various energy sources and state their present scenario in India
2. State the solar energy applications and functions of system components.
3. Apply the basics of wind and ocean energy for electricity generation.
4. Describe the conversion process of biomass energy.
5. State and apply the various Emerging Energy Technologies

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Energy Science and Sources**	1a. Define energy conservation law 1b. Identify various sources of energy and compare them. 1c. Understand the present energy situations and schemes for renewable energy promotion.	1.1 Concept of energy, Law of conservation of energy 1.2 Introduction to conventional energy sources and renewable energy sources 1.3 Comparison between energy sources 1.4 Present scenario in energy crises in India and world 1.5 Government schemes to promote use of renewable energy sources	02

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Solar Energy**	2a. Define the basic conversation principle of solar energy. 2b. Describe the solar system used in water heating. 2c. State the applications of solar energy	2.1 Introduction to solar energy 2.2 Physical principles of conversion of solar radiation into heat 2.3 Flat plate collectors and concentric collectors 2.4 Solar energy storage system 2.5 Applications of solar energy in Water heating, Space heating and cooling, Greenhouses and electricity generation	04
Unit-III **Wind and Oceans Energy**	3a. Understand the concept of electrical wind generation. 3b. State basic components of WECS. 3c. Distinguish Wind and Oceans Energy 3d. Explain ocean thermal electric power generation 3e. Describe the principle of tidal power generation.	3.1 Basic principles of wind energy conversion 3.2 Site selection considerations 3.3 Basic components of a wind energy conversion system (WECS). 3.4 Advantages and disadvantages of WECS. 3.5 Applications of Wind energy. 3.6 Introduction of Oceans energy 3.7 Methods of ocean thermal electric power generation 3.8 Open cycle and closed cycle Ocean thermal energy conversion (OTEC) system 3.9 Basic principle of tidal power	05
Unit-IV **Bio mass Energy**	4a. State resources of Biomass energy. 4b. Describe the biomass conversion process. 4c. Know Bio Diesel and Bio Mass plant 4d. State information of Government schemes to promote use of biomass energy.	4.1 Introduction to biomass energy 4.2 Biomass energy resources 4.3 Biomass conversion process : Direct combustion, thermo chemical conversion, bio chemical conversion 4.4 Introduction to bio gas plant 4.5 Introduction to Bio Diesel, Bio Mass plant 4.6 Government schemes to promote use of biomass energy	03
Unit-V **Emerging Energy Technologies**	5a. Define the Hydrogen Energy. 5b. Describe properties of hydrogen and its sources. 5c. Know the hydrogen handling.	5.1 Hydrogen Energy 5.2 Properties of hydrogen 5.3 Hydrogen as source of renewable energy 5.4 Sources of hydrogen 5.5 Production of hydrogen 5.6 Storage and transportation 5.7 Introduction to Carbon Capture and Storage (CCS)	02
TOTAL			**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

A. SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Group discussion on benefits of renewable energy sources.	02
2	II	Visit solar water heating system demonstrate and write report on demonstration of solar water heater	04
3	II	Report on demonstration of solar light with the connection diagram.	04
4	II	Visit to the solar power plant write report and draw layout of solar power plant.	06
5	III	Visit to the wind power plant write report and draw a layout of Wind power plant	06
6	IV	Report on demonstration of bio mass gasifier	04
7	IV	Case study of Bio gas plant and tidal power plant	04
8	V	Group discussion on Emerging Energy Technologies and their future	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect renewable energy information from web source.
2. Collect and analyse information from web site of BEE (Bureau of Energy Efficiency) and MEDA (Maharashtra Energy Development Agency) on energy.
3. Prepare a report on Government schemes to promote use of renewable energy sources.
4. Identify and collect different manufactures of solar water heater.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video demonstration of solar water heater system.
2. Visit to solar plant to understand the working of solar generation.
3. Arrange expert lectures on new trends in renewable energy.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Renewable energy sources and conversion technology	Bansal Keemann, Meliss,	Tata McGraw Hill
2	Renewable energy resources and emerging technologies	Kothari D. P.	Prentice Hall of India Pvt. Ltd.
3	Non-Conventional energy Sources	Rai G. D.	Prentice Hall of India Pvt. Ltd.
4	Nonconventional Energy	Ashok V. Desai	New Age International Publishers Ltd

B) Learning Websites

1. Website of bureau of energy and efficiency: www.bee-india.nic.in
2. www.betterenergy.org
3. www.mahaurja.com Maharashtra Energy Development Agency (MEDA):
4. www.worldenergy.org
5. www.renewableenergyworld.com

C) Major Equipments/ Instruments with Broad Specifications

1. Solar water heating system
2. Solar lighting system

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		M			L	H					
CO2			H								M
CO3		M				H					
CO4			H								
CO5					M	H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Professional Practices (PPR) **COURSE CODE :** 6410

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests. While selecting candidates a normal practice adopted is to see general confidence, attitude and ability to communicate and attitude in addition to basic technological concepts.

The purpose of introducing professional practice is to provide opportunity to students to undergo activities which will enable them to develop confidence. Information search, Industrial visits, expert lectures and case study will increase participation of students in learning process.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand techniques of data collection.
2. Study professional techniques through industrial visits and expert lectures.
3. Understand and find solutions for technical problems.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Collect technical information from different sources.
2. Write industrial visit reports.
3. Acquire technical knowledge through expert lecture.
4. Develop problem solving techniques through case studies.

4.0 COURSE DETAILS:

Note: There are no separate classes for theory as given below. The relevant theory has to be discussed before the practical during the practical sessions.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit I **Information search and data collection**	1a. List different tools used in electronic workshop 1b. Explain the procedure of installation of electronic panels. 1c. State various soft-wares used in electronics 1d. Make a comparative chart of specifications of different electronic tools/equipments. 1e. Make a pictorial process flow of IC manufacturing.	1.1 Information search(Any Four) Collection of information about tools/equipments used in electronic industries/workshops a. Software and simulators used in electronics for circuit and PCB making b. Market survey for motors used in electronic application c. Non-Conventional Energy Sources with focus on solar energy d. installation and maintenance of electronic panels, PLCs e. CDMA

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		f. GPS g. Manufacturing process of ICs h. WLL Technology i. Nano Technology j. Image processing 1.2 Any other suitable areas
Unit II **Industrial visit**	2a. Develop technical report writing skills on industrial visits	2.1 Industrial visits and report writing of : **(Any Two)** a. Telephone Exchange b. Television Relay station c. Industrial automation unit d. Data Acquisition System e. Sugar Mill, Paper Mill, Cement Industry f. Satellite Earth Station, g. Radar Establishment. h. MTSO. i. Any other relevant area.
Unit III **Expert lectures**	3a. Write report on the expert lecture to obtain the professional knowledge.	3.1 Expert lectures from professionals/ industries on. (Any Two) a. Emerging Technology b. Fiber optics communication system c. Bluetooth Technology d. Mobile communication e. Software debugging f. Computer security systems g. Digital Inverters h. Soft computing i. Wi-Fi, Wi-Max, WLAN, BAN technologies j. Neural network. k. Total Quality Management l. Carrier guidance and interviewing techniques. m. Self-employment. n. Any other relevant topic.
Unit IV **Mock Interview**	4a. Demonstrate oral communication skill and confidence	4.1 The student should give mock interview before panel of three experts.
Unit V **Group Discussion and SWOT analysis**	5a. Participate in group discussion on specified topic 5b. Express opinion and share views about the specified topic 5c. Make the report of group discussion	5.1 The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members.

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect specifications and rates for different Electronic Instruments, PLC, devices and systems.
2. Collect working standards of WLL, Wi-Max, WLAN, Bluetooth technologies.
3. Observe a video on expert lectures from internet on electronic engineering topic and draft a report on it.

7.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software; arrange industrial visits, expert lectures, case studies related to civil engineering.

8.0 LEARNING RESOURCES:

A) National and international Journals and Magazines viz IETE Journal of Research, IETE Technical Review, Journal of IE(I), Electronics For You, Elector Electronics etc.

B) Software/Learning Websites

1. www.ieee.org.in
2. www.iete.org
3. www.ieindia.org

C) Major Equipments/ Instruments with Broad Specifications

Not Applicable

9.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		H			H		H	H	H		M
CO2		H						M	H		M
CO3		H			M	M	M				M
CO4	H	H	H	H	M			M			H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Seminar (SEM) **COURSE CODE :**6411

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	02	02	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

An engineering technician has to face number of problems / situations in his professional life and he has to convey his ideas through presentation. Knowledge of scientific way of solving the problems and increase ability to apply it, to find alternative solutions for solving such problems will help a technician in his professional life.

The involvement of student in the seminar work will help him to develop this competency, combine the theoretical and practical concepts studied into useful applications, develop planning and execution skills and perform analyzing and trouble shooting of their respective projects, develop skills in interacting with others, to work in team, search for obtaining the information and materials from number of sources and present the work in neatly documented report and present.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop abilities to search information.
2. Convey ideas through seminar.
3. Collect data, information from various resources.
4. Develop planning of seminar activities.
5. Develop skill to communicate the problems and solutions.
6. Develop skill to prepare reports.
7. Develop presentation skills.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes as applicable to seminar:

1. Know and select seminar topic or problem statement in engineering field.
2. Familiar with maintaining diary for progress of seminar activities.
3. Carry out literature survey from various resources.
4. Provide ideas in problem solving.
5. Develop document preparation skills.
6. Use of presentation skill for seminar delivery.
7. Keep updated with latest trends of knowledge and skills in professional life.

4.0 COURSE DETAILS:

Activity No	Activities	Hours
1	Briefing about selection for seminar topics in class: Discussion in class	02
2	Search seminar topics and approval of topic from guide from searched topics.	04
3	Preparation of Seminar Diary for writing progress	--
4	Collection of data and literature for seminar from: internet / visit / Journals /Books/EBooks	04
5	Preparation of synopsis of seminar topic: print draft copy	04
6	Submission of seminar synopsis to guide (Printed copy)	--

Activity No	Activities	Hours
7	Guidance about preparation of document by guide	02
8	Preparation of document by students	06
9	Editing document	04
10	Submission of Seminar and presentation document: Hard copy & Soft copy of power point	02
11	Submission of diary	--
12	Seminar Presentation	04
	TOTAL	**32**

5.0 AREAS FOR SELECTION OF SEMINAR:

S. No.	Areas For Selection
1	Image processing
2	FPGA
3	CPLD
4	Industrial Automation
5	New Trends in Electric Drives
6	LASIX
7	SCADA
8	Mobile communication
9	Robotics/Bio-Mechatronics
10	Automation and Control of drives
11	Biomedical Instrumentation.
12	Microcontroller and microprocessor based applications
13	DSP & its applications.
14	Communication-Blue tooth, Mobile communication (GSM, CDMA), Optical communication, Satellite communication.
15	PC based applications

6.0 INSTRUCTIONAL STRATEGIES:

Classroom Teaching, Industrial visit, Library Assignment, Home Assignment, Group Discussion, Case Studies.

7.0 LEARNING RESOURCES:

Magazines, Journals, Papers: National & international Reference Books, Internet, Previous seminars, Text Books, Codes of Practices e. g. IS Codes, Video Cassettes, Audio Cassettes, Compact Discs, Charts, Transparencies, Software, Models, Industrial visits, expert lectures/workshops

8.0 GUIDELINES FOR SEMINAR:

1. **Selection of topic for seminar:**
   a. The student shall search various from resources and get the topic approved
   b. Topic of seminar should not be part of programme curriculum but will be based on curriculum with new developments.
   c. Topic of seminar should not be from the project taken by the group or by individual.
   d. Selection of topic should be finalised in consultation with teacher guide allotted for the seminar.

2. **Submission of Seminar Document:**
   a. The student shall get the seminar draft approved from Guide and complete final document.
   b. Each student shall prepare two hard copies of final seminar document and retain one copy with student and submit one hard copy to library and soft copy for department.

c. The structure of the seminar document shall be as per the following format: Certificate / Acknowledgement / Index / Introduction / Detailed content / Conclusion / References. The photos, charts, animations, certificates from supporting agencies.
d. Modify format suitably as per requirement of the seminar.
e. The seminar report shall be of minimum 10 pages and Max. 20 pages with 1.5 line spacing. Font: New Times Roman, left margin 3 cm, right margin 1.5 cm, top margin 2 cm, bottom margin 2 cm, header & footer 1.5 cm, page numbers, size of font 12 pt, paragraphs left and right justified. It should be certified by seminar Guide and Head of department.

3. Evaluation of Seminar:

Evaluation of seminar will consist of Progressive Assessment, Presentation

i. Progressing Assessment:

1. Progressive assessment will be based on attendance, searching of various seminar topics, selection of title, collection of data from internet, Journals, Literatures, organization of data and preparation of document.
2. The student has to get seminar document assessed from guide regularly.
3. Head of department will sign once in a month.
4. The attendance of the student shall carry 05 marks as follows
   a. Below 75 % : 00 marks
   b. 75 % and below 80 % : 02 marks
   c. 80 % and below 85 % : 03 marks
   d. 85 % and below 90 % : 04 marks
   e. 90 % and above : 05 marks

ii. Presentation of Seminar:

1. The time for presentation shall be 7 to 10 minutes per student
2. the question answer session time shall be 2 to 3 minutes per student
3. Evaluation of presentation of seminar will be carried out by a panel of teaching staff from institute based on the following point
   a. Confidence and courage
   b. Technical knowledge acquired
   c. Presentation skill
   d. Use of presentation medium e.g. AV aids, animation

iii. Marking scheme for Seminar.

Progressive assessment	Confidence and courage	Technical knowledge	Presentation skill	Use of presentation medium	Total
25	05	05	10	05	50

9.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1								H			
CO2								M		H	
CO3		H						M			
CO4			H		M					L	
CO5									H	M	
CO6											
CO7											H

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Project (PRO) **COURSE CODE :** 6412

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	50	50*	100
					Min.	--	--	--	--	20	20	--

* Indicates TW to be assessed by external & internal examiners.

1.0 RATIONALE:

An engineering technician has to face number of problems / situations in his professional life. Knowledge of scientific way of solving the problems and increased ability to apply it to find alternative solutions for solving such problems will help a technician in his professional life.
The involvement of the student in the project work will help the student to develop this competency, combine the theoretical and practical concepts studied into useful applications, develop planning and execution skills and perform analysing and trouble shooting of their respective projects, develop skills in interacting with others, to work in team, search for obtaining the information and materials from number of sources and present the work in neatly documented report.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Integrate the knowledge of engineering program
2. Develop the skill to identify the problem, define the problem statement
3. Develop scientific attitude for stepwise solutions to the problems
4. Develop attitude to work in team and act as leader of project
5. Develop planning, execution skills
6. Build multidisciplinary concept with cost considerations
7. Understand recent developments in engineering fields and prepare report

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate some of course outcomes as applicable to project

1. Participate effectively in group work
2. Collect, analyse and synthesise the data
3. Conduct a survey and investigate the activities
4. Make appropriate decision
5. Act as leader for group task
6. Develop cost consideration
7. Prepare technical reports

4.0 COURSE DETAILS:

Activity No	Activities	Hours
1	Formation of Group	--
2	Selection of Project: Individual/Group discussions	02
3	Define Problem statement for project work	02
4	Decide Strategies/Methodology to carry out project	02
5	Literature Survey/data survey	04
6	Submission of synopsis: by each group	02
7	Project activity plan-Defining activities, strategy, duration	02
8	Allocation of work responsibility to individual/team	02

Activity No	Activities	Hours
9	Visits to Industries / Institutions / Market/field work/sites	04
10	Collection of Data /Survey/Analysis	06
11	Design of Components, preparation of drawing, estimates wherever required, printed circuits design, its checking,	10
12	Fabrication, Assembling, Model/Prototype development, Testing as per project requirements	08
13	Progressive presentation of work and recording in diary	--
14	Consolidation of work allotted to individual or team	06
15	Presentation of initial draft: pre submission draft	06
16	Final Project Report: Printed: Submission: soft & Hard copy	04
17	Seminar on presentation of project work by team/group	04
	TOTAL	**64**

The Project is also included with Seminar with the aim to develop certain set communication skills (preparation of report, writing survey report, writing laboratory experiment results, writing conclusions of the work done and physical phenomenon observed, participating in group discussions, verbally defending the project in the form of Seminar etc.)

5.0 AREA OF SELECTION FOR PROJECT:

These are only guidelines; any project related to Electronics and Telecommunication Engineering depending upon the availability of projects may be included. Preference should be given to practical oriented projects according to the local needs.

Some of suggested projects are given below:

S. No.	Areas For Selection
1	DC/AC drives
2	Microcontroller based applications
3	PC based applications
4	Communication-(Blue tooth, Mobile communication (GSM, CDMA), Optical communication.
5	Biomedical Applications
6	Projects based on power electronics devices.
7	Industrial Automation-(PLC based, Robotics, Home automation)
8	Projects for Agricultural applications.
9	VLSI / Embedded Systems
10	DSP based projects
11	Antenna and microwaves

6.0 GUIDELINES FOR PROJECT:

A. Group Formation:

1. The department Head / Officer Incharge should make sure that the project groups are formed within **one week** of the beginning of academic term and assign a faculty as project guide.
2. The students may be asked to work individually or in groups of five students. The group size may be varied in accordance with the effective compliance of project work.
3. The group can decide the leader and distribute work and prepare the group management structure.

B. Finalization of Project Title:

1. The students are expected to take up a project with the guidance of a Project Guide from the institute / Industry Expert / Sponsored by industry, Institute, society, self.
2. The project shall be as far as possible industrial project useful to society.
3. The students can seek help from TPO / HOD / Guide.
4. The group of students / Project guide / authority shall see the viability / feasibility of project over the duration available with the students and capabilities and setup available.

C. Note:

1. The group / student shall prepare Project Diary with Name of Project, Name of Students in group, their attendance and daily progress and get assessed from guide from time to time during project hours.
2. Each student shall maintain individual progressive assessment sheet and get assessed from guide from time to time during project hours.
3. The title of the project should be finalized within **two weeks** after the group formation and a synopsis of the project should be submitted to the guide.
4. An abstract (synopsis) not exceeding 100 words, indicating salient features of the work should be submitted to guide
5. Modify format suitably as per requirement of the project.

D. Project Execution:

1. Guide shall monitor the work and help the students from time to time.
2. The progress shall be presented before the guide every week during project hours. The group shall take the signature of guide on Project Diary and Individual Progressive Assessment Sheet.
3. Head of department will sign once in a month.
4. The students shall design parts, prepare their drawing showing all details and manufacture within the institute / sponsoring industry / workshop in local areas.
5. The guide should maintain a record of progressive / continuous assessment of project work and observe the progress of each group member on weekly basis.
6. The same shall be kept ready for submission to the external examiner before the final examination.

E. Evaluation of Project:

1. The evaluation of individual progress shall be followed as per the chart given.
2. External examiner and guide shall jointly evaluate the project.
3. The project can be evaluated on site if it is difficult to bring or demonstrate the trials in the institute
4. The attendance of the student shall carry 05 marks as follows
    i. Below 75 % : 00 marks
    ii. 75 % and below 80 % : 02 marks
    iii. 80 % and below 85 % : 03 marks
    iv. 85 % and below 90 % : 04 marks
    v. 90 % and above : 05 marks
5. The details of project assessment are mentioned in Annexure II

F. Project Report:

1. The student shall get the initial draft copy of the project approved from the Project Guide.
2. Structure: It shall be as follows
    - Title page, Inner title page (white), Certificate, Certificate from industry, Synopsis, Acknowledgment, Table of Contents, List of table & figures (optional), Introduction, Objectives of the Project, Methodology used, Design, Drawing of the part and assembly, Testing, Costing, Result, Conclusions & Scope for future, Merits, Demerits, Applications, Bibliography

- Annexure consists of various designed parts and assembly drawings, photographs, charts, statistical data
- CD of video clips /Power Point presentation

3. Each group has to submit one copy of project report to the library and one soft and hard copy to the department apart from the individual copy.
4. The project report will be of 40 to 50, A4 Size pages with 1.5 line spacing. Font: New Times Roman, left margin 3 cm, right margin 1.5 cm, top margin 2.5 cm, bottom margin 1.5 cm, header & footer 1.5 cm, page numbers, size of font 12 pt, paragraphs left and right justified.
5. Chapters (to be numbered in Arabic) containing Introduction-which usually specifies scope of work and the present developments. Main body of the report divided appropriately into chapters, sections and subsections. The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc. and subsections as 2.2.3, 2.5.1 etc.
6. The chapter must be left or right justified (font size 16). Followed by the title of chapter centered (font size 18), section/subsection numbers along with their headings must be left justified with section number and its heading in font size 16 and subsection and its heading in font size 14. The body or the text of the report should have font size 12.
7. The figures and tables must be numbered chapter wise.
8. The last chapter should contain the summary of the work carried, contributions if any, their utility along with the scope for further work.

9. Reference **OR** Bibliography:

   The references should be numbered serially in the order of their occurrence in the text and their numbers should be indicated within square brackets for e.g. [4]. The section on references should list them in serial order in the following format.

   a. For textbooks – Dr. V.L. Shah & Veena Gore, Limit State Design of Steel Structures, Structures Publications, 1 Edition, 2009.
   b. For papers - David, Insulation design to combat pollution problem, Proc of
   c. IEEE, PAS, Vol 71, Aug 1981, pp 1901-1907.
   d. Only SI units are to be used in the report. Important equations must be numbered in decimal form
   e. All equation numbers should be right justified.

10. Each student from group shall have one copy with individual certificate only.
11. The project report and progressive assessment sheets are to be submitted before the end of term declared in the Academic Calendar of the institute.

7.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H										
CO2		H									
CO3							M				
CO4	M					L					
CO5				L			M				
CO6			H				H				
CO7			H								

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and telecommunication Engineering(EL)
COURSE : Applied Electronics (AET) **COURSE CODE :** 6441

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

To make the students familiar with basic facts, concepts, principles and characteristics of electronic devices used in industry. For effective operation and maintenance of electronic devices used in industry technician should have sound knowledge of working principles and facts of electronic circuits.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand principles and terminology of electronics.
2. Understand the use of semiconductor devices in electronic circuits
3. Interpret characteristics of electronic devices
4. Understand the working of basic circuits such as power amplifiers, tuned amplifiers, FET, MOSFET etc.
5. Build and test simple circuits
6. Compare and classify power amplifiers, oscillators, time base generators.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Draw and explain principle of operation of wave shaping circuits, power amplifiers, Tuned amplifiers, time base generator and oscillators
2. State applications of wave shaping circuits, power amplifiers, Tuned amplifiers and oscillators
3. Assemble Simple electronic circuits.
4. Trace the fault in given circuit using voltage and waveform methods.
5. Identify faulty component in given electronic circuit.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Wave shaping circuits and multipliers**	1a. State necessity of different types of wave shaping circuits. 1b. Classify different types of wave shaping circuits. 1c. Draw the circuit and explain working of RC integrator and differentiator 1d. Draw the circuit and explain working of diode as clipper 1e. Draw the circuit and explain working of clamper	1.1 Necessity of wave shaping circuits. 1.2 Linear circuits – RC integrator and differentiator – input /output waveforms and frequency response. 1.3 Non-linear circuits – Clipper- diode series and shunt, positive and Negative, biased and unbiased and combinational clipper. 1.4 Clampers – necessity and types - positive and negative 1.5 Voltage multiplier-Necessity and types - Doubler, Tripler	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1f. State need of voltage multiplier 1g. Draw the circuit and explain working of Voltage doubler.		
Unit-II **Power Amplifiers**	2a. Differentiate between voltage and power amplifier. 2b. Explain working of different types of power amplifiers and their applications. 2c. Determine the efficiency of Class A and Class B power amplifier. 2d. Explain working of class B Push-Pull amplifier. 2e. Compare different types of power amplifiers.	2.1 Comparison of voltage and power amplifiers 2.2 Definitions of collector efficiency, distortion and power dissipation capability. 2.3 Circuit diagram, operating principle, characteristic features, advantages, disadvantages, applications and efficiency of class A, B, C and AB amplifiers. 2.4 Circuit diagram, operating principle, characteristic features, advantages, disadvantages and applications of Class B push-pull amplifier 2.5 Comparison of class A & B amplifiers. 2.6 Crossover distortion and use of Complementary symmetry power amplifiers. Thermal runaway and use of heat sink (No mathematical analysis)	12
Unit-III **FET Amplifier and Tuned Amplifiers.**	3a. Explain construction and working principle of JFET 3b. Describe Configurations of JFET amplifier 3c. Explain construction and working principle of enhancement type MOSFET 3d. Compare JFET and MOSFET 3e. Types of MOSFET: Define and explain MOSFET 3f. Compare JFET and MOSFET as amplifiers. 3g. Differentiate BJT and JFET 3h. Draw and explain the operation of single, double tuned circuit. 3i. List Advantages and disadvantages of single tuned amplifier.	3.1 JFET: Introduction Construction, operation, Characteristics, Parameters of JFET – rd, gm, μ 3.2 n-channel and p- channel JFET 3.3 FET configurations: common source, drain and gate 3.4 Comparison of BJT and JFET 3.5 Symbol, construction, working and applications of Depletion and Enhancement type MOSFET 3.6 Necessity of tuned amplifier. Basic tuned circuits, series and parallel resonance in tuned circuits. 3.7 Resonant frequency, resonance curve, band width and selectivity of parallel resonant circuit. 3.8 Circuit diagram, working and frequency response of single tuned, double tuned circuits 3.9 Circuit diagram, working & frequency response of stagger tuned Circuits 3.10 Advantages and disadvantages of tuned voltage amplifiers	12
Unit-IV **Feedback**	4a. Describe different types of feedback. 4b. List the merits and	4.1 Concept of feedback: negative and positive 4.2 Merits and demerits of negative	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
amplifier and oscillators	demerits of negative feedback 4c. Explain voltage series and voltage shunt type of feedback in amplifier circuits. 4d. Justify the use of positive feedback in oscillator 4e. Explain the working principle of different types of oscillators. 4f. List applications of various types of oscillators.	feedback 4.3 Negative feedback In amplifiers: Derivation of equation for overall gain of negative feedback amplifier 4.4 Characteristics: Gain, input and output impedance, stability, bandwidth, frequency response, sensitivity, distortion and noise 4.5 Block and circuit diagram of Voltage series and shunt amplifier, current series and shunt amplifier 4.6 Positive feedback in oscillators 4.7 Barkhausen's criteria for oscillation, Overall gain of positive feedback amplifier, Tank circuit 4.8 Operating principles of RC and LC oscillator 4.9 Circuit diagram, equation for frequency of oscillation and frequency stability General applications of RC oscillators - RC phase shift, Wien bridge (using BJT) LC oscillators – Colpitts and Hartley oscillator(using BJT) Piezoelectric effect, Crystal oscillator	
Unit-V **Multi-vibrators**	5a. Describe working of Transistor as a switch. 5b. Draw and explain operation of astable multivibrator. 5c. Differentiate between Astable, Monostable and Bistable multivibrators 5d. List applications of Schmitt trigger	5.1 Transistor as switch Definition and graphical Representation of different time periods. 5.2 Multivibrators- Circuit diagram, operation, waveforms and Applications of Astable, Monostable and Bistable multivibrator. 5.3 Circuit diagram, operation, waveforms, Hysteresis and applications of Schmitt trigger. 5.4 Comparison of multivibrators	10
Unit-VI **Time base generator**	6a. Explain UJT Relaxation Oscillator. 6b. Draw and explain miller sweep generator. 6c. Draw and explain bootstrap circuit	6.1 Voltage time base Generator, exponential sweep generator 6.2 UJT: Construction, equivalent circuit, I-V characteristics, UJT as relaxation Oscillator: circuit diagram, working and waveforms. 6.3 Transistorised current time base generator, bootstrap and Miller sweep generator 6.4 Comparison of Miller sweep and bootstrap circuit, applications of current sweep circuit	10
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Wave shaping circuits and multipliers	02	08	04	14
II	Power Amplifiers	02	08	04	14
III	FET amplifier and Tuned amplifier	02	12	--	14
IV	Feedback Amplifiers and oscillators	06	04	04	14
V	Multivibrators	04	08	--	12
VI	Time base generator	04	04	04	12
TOTAL		**20**	**44**	**16**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Design of unbiased positive and negative clipper circuit using diode and observe the waveforms for sine wave input.	04
2	I	Design of positive and negative unbiased clamper circuit using diode. Observe the waveforms for sine wave input	04
3	II	Assemble and test the performance of voltage doubler circuit.	04
4	II	Assemble and test voltage tripler circuit.	04
5	II	Build and test class-A Power amplifier.	04
6	III	Trace the circuit and Plot Frequency response of FET amplifier	04
7	II	Determine the efficiency of Class-B push-pull power amplifier.	04
8	III	Trace the circuit and Plot the frequency response of single tuned amplifier.	04
9	IV	Trace the circuit and Plot Frequency response and bandwidth of negative feedback amplifier.	04
10	IV	Build the circuit and measure the output frequency of RC Phase shift oscillator.	04
11	IV	Trace the circuit and Measure the output frequency of Colpitts oscillator.	04
12	IV	Trace the circuit and measure the output frequency of Hartley oscillator.	04
13	V	Assemble and study the circuit of transistor as switch on breadboard	04
14	V	Trace the circuit and measure time period and frequency of astable multivibrator	04
15	V	Trace the circuit and Calculate the time period of pulse of monostable multivibrator.	04
16	VI	Trace the circuit and observe the waveforms of UJT relaxation oscillator	04
TOTAL			**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Download data sheets of BJT, FET and MOSFET.
2. Collect data about specifications and ratings of electronic devices from the datasheets.
3. Collect data about prices of BJT, FET and MOSFET from local market.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic active components, devices and circuits.
2. Arrange expert lecture of an industry person in the area of electronics.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	A text book of Applied Electronics	S. Sedha	S. Chand Publisher ISBN-9788121927833
2	Electronic Devices and Circuits	David A. Bell	Oxford
3	Electronic Devices And Circuits	G.K. Mittal	Khanna
4	Electronics Circuit and Circuit Theory	Robert L. Boylestead Louis Neshelsky	Pearson
5	Electronic Principles	Malvino	McGraw Hill
6	Electronic Devices and Circuits	Motershed	PHI ISBN-9788120301245
7	Basic Electronics and Linear circuits	N.N. Bhargava S.C. Gupta	Tata McGraw Hill Education

B) Software/Learning Websites

1. http://www.nptl.com
2. http://www.electronictutorial.com
3. http://www.allaboutcircuit.com

C) Major Equipments/ Instruments with Broad Specifications

SN	Equipments/ Instruments with Broad Specifications
1.	Cathode ray oscilloscope Dual Channel, 4 Trace CRT / TFT based, Bandwidth 20 MHz/30 MHz, X10 magnification 20 nS max sweep rate, Alternate triggering, Component tester and with optional features such as Digital Read out, USB interface
2.	Function Generator 1 MHz, sine, square, triangular, ramp and pulse generator Freq range 0.01Hz to 1 MHz, Output amplitude 20V open circuited, Output impedance 50 ohms. Facility to indicate output frequency and amplitude on display.
3.	Regulated power supply 0 to 30 V 2A/3 A dual DC regulated power supply with SC protection digital output meters for current and Voltage
4.	CRO Probe
5.	Phase shift oscillator-Experimental kit
6.	Colpitts oscillator- Experimental kit
7.	UJT relaxation oscillator- Experimental kit
8.	Breadboard
9.	Digital multimeter

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		H	H	M	H					
CO2	H		H	H	M	H					
CO3			H	H	H	H					
CO4			H	H	H	H					
CO5	M		H	H	H	H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Audio Video Engineering (AVE) **COURSE CODE** : 6442

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	25	--	125
					Min.	32	--	40	--	10	--	--

1.0 RATIONALE:

The field of television engineering and video system has witnessed rapid growth especially in digital TV broadcast and recording system. Thus with widespread use of advanced audio and video equipments, the course audio and video engineering is introduced in this curriculum.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand operation of audio amplifiers.
2. Understand CD/DVD player mechanism.
3. Analyse quality of reception of various sound systems and graphic equalizer.
4. Understand principle of operation of various advanced TV systems

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. List and explain different types of audio amplifiers and distinguish between them.
2. Identify and state different components used in CD /DVD player.
3. Identify and list different types of loudspeakers and microphones.
4. Define and explain various terms and standards used in TV systems.
5. Draw and illustrate different types of advanced TV systems.
6. Identify faults in various sections of a color TV.
7. Test different section of audio / video system.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Audio fundamentals and devices**	1a. Describe the fundamental audio signal characteristics: sound intensity, pitch, fidelity and loudness 1b. Explain optical sound recording and MP3 standard. 1c. Distinguish between different types of audio amplifiers. 1d. Draw labelled sketch of Hi-Fi amplifier. 1e. Explain operation of	1.1 Basic characteristics of sound signal: sound intensity, level and loudness, pitch, frequency response, fidelity, linearity and reverberation 1.2 Sound recording: Optical recording, stereophony and multichannel sound, MP3 standard, Dolby NR recording system 1.3 Introduction to amplifiers, types, mono, stereo, difference between stereo amplifiers and mono amplifiers, 1.4 Public address system-necessity and working block diagram of Hi-Fi amplifiers and its working. Controls available on it and their function,	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	graphic equalizer. 1f. List types of speakers and microphones. 1g. Explain cross-over network circuit	Graphic equalizer concept-circuit diagram and its operation(5 point circuit diagram) 1.5 Microphone-types, wireless microphone 1.6 Types of speaker –woofer, midrange, tweeter, cross-over network circuit and its function	
Unit-II **CD/DVD player**	2a. Explain the principle of detection mechanism of CD /DVD player 2b. List the components used in CD/DVD mechanism. 2c. State the function of remote control used in CD player. 2d. Compare DVD with Blue Ray Disc.	2.1 CD- material used, size and capacity 2.2 Block diagram and operation of CD player. 2.3 Components used for CD mechanism, CD pick up assembly, gear system. Drive motors, CD lens. Function of front panel control. 2.4 Function of remote control, transmitter and receiver unit used in CD player. 2.5 DVD player- working principle and operation. 2.6 Blue ray disc-storage capacity, technology used and difference between blue ray and DVD.	08
Unit-III **Colour Television Systems and Signals**	3a. Define various terms used in TV systems 3b. Draw and Explain composite video system 3c. Explain CCIR-B standards and channel allocation for band I and III.	3.1 Colour fundamentals: Primary Colours, Secondary Colours. 3.2 Grass man's Law, Additive Colour mixing, Subtractive colour mixing and colour perception, mixing of colour, hue, saturation and luminance. 3.3 Aspect ratio, Persistence of vision, Scanning Types-Interlace, progressive, vertical and horizontal resolution, vestigial side band transmission, Compatibility. 3.4 Composite Video Signal- explanation with waveform. 3.5 CCIR-B Standards for Colour Signal Transmission and Reception, TV channel allocation for BAND-I and BAND-III, Frequency interleaving, color burst signals, choice of subcarrier frequency.	08
Unit-IV **Transmitter and Receiver**	4a. Identify modulation technique used for audio and video signal transmission and list the features of audio signals. 4b. Distinguish between positive and negative modulation 4c. Describe various TV	4.1 Audio and video signal transmission using AM and FM Modulation, Positive and Negative Modulation, Merits and Demerits of Negative modulation. 4.2 TV camera tubes: principle and working of vidicon, plumbicon and solid state camera based on CCD. 4.3 TV Transmitting antennas 4.4 Block diagram of colour TV transmitter, Block diagram and	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	transmitting antennas. 4d. Describe various TV camera tubes 4e. Explain the function of color TV transmitter and receiver 4f. Explain SDI and HDMI.	operation of colour TV receiver, specifications of colour TV receiver. 4.5 SDI and HDMI-serial digital interface/high definition serial digital interface, high definition multimedia interface/video interface.	
Unit-V **Colour Television system**	5a. Draw and explain different colour TV systems. 5b. Differentiate between NTSC, PAL and SECAM 5c. Explain HDTV, LCD and LED TV.	5.1 NTSC colour television transmitter system, NTSC colour receiver, NTSC coder and decoder. 5.2 Limitations of NTSC. 5.3 PAL colour system, PAL burst, PAL coder, decoder. 5.4 Merits and Demerits of PAL. 5.5 SECAM colour system, merits and demerits of SECAM, SECAM coder and decoder. 5.6 Characteristics and comparison of all three colour systems. 5.7 HDTV-Development of HDTV. 5.8 LCD and LED technology-working principle of LCD and LED systems.	10
Unit-VI **Cable Television**	6a. List specifications of various components used in cable TV. 6b. Expalin construction of DTH system. 6c. Explain working of MATV, CATV and CCTV.	6.1 Constructional details working and radiation pattern of dish antenna 6.2 Working principle of following components-LNBC, Diplexer, attenuators, connectors (two ways, three ways) amplifiers and cables. 6.3 Direct to home systems-Introduction and block diagram 6.4 MATV, CATV and CCTV: Block diagram, working and applications.	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Audio fundamentals and devices	04	04	04	12
II	CD/DVD player	04	04	04	12
III	Colour Television systems and Signals	02	08	04	14
IV	TV Transmitter and Receiver	04	08	04	16
V	Colour Television System	04	08	04	16
VI	Cable Television	02	04	04	10
	TOTAL	**20**	**36**	**24**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours.
1	I	Trace output stage of Hi- Fi amplifier. Draw component layout of it.	02
2	II	Identify various controls on front panel of CD player	02
3	III	To obtain composite video signal by using TV pattern generator and measure its dimensions	02
4	IV	To visualize / compare the various patterns of colour TV pattern generator for fault finding	02
5	IV	Trace the circuit diagram of colour TV receiver.	02
6	IV	Trace the tuner section.	02
7	IV	Trace colour chroma section.	02
8	IV	Trace video IF and sound IF section.	02
9	IV	To trace and explain horizontal oscillator and sync separator section.	02
10	IV	To trace vertical oscillator and output section.	02
11	IV	To observe waveforms at various sections of colour TV.	02
12	IV	To locate the different faults at various sections of colour TV receiver.	02
13	V	Verify the performance of LED TVs. Compare performance parameters of at least three brands.	04
14		Industrial visit to Doordarshan Kendra and prepare a report	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect information about LED, LCD displays used in TV.
2. Visit to TV station and write a report.
3. Estimate cost and layout of cable TV.
4. Download from internet/website different ICs and their specification used in color TV system.
5. Collect the information about Set Top box used for cable TV at home and installation of DTH system.
6. Conduct market survey for latest Audio Video systems and compare specifications of reputed brands and prepare a report.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video to demonstrate the working principles, constructional features, testing and fault finding of different types of TV circuits.
2. Arrange a visit to TV relay centre and cable network station.
3. Arrange expert lecture of an industry person in the area of TV.
4. Arrange workshop to demonstrate fault finding and repairing in TV circuit

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Television and video Engineering	A. M. Dhake	TMH, ISBN 0-07-460105-9
2	Colour Television and video tech.	Maini	PHI
3	Modern TV Engineering	Gulathi	Wiley Publication
4	Basic TV and video system	Barnad Grob	TMH
5	Television Engineering and Video System	R. G Gupta	TMH, ISBN 0074601059 97800-74601051
6	Audio video systems	R. G Gupta	TMH, ISBN 0070699763
7	Modern CD player servicing manual	Manohar Lotia	BPB PUBLICATION ISBN 0-07-044555-9
8	Audio video systems : principle practices and troubleshooting	Bali R and Bali S.P.	Khanna Book Publishing Co. (P) Ltd., 2010Delhi, India, latest edition

B) Software/Learning Websites

1. http://www.en.wikipedia.org/wiki/Compact_Disc_player
2. http://www.en.wikipedia.org/wiki/High-defination_television
3. http://www.howstuffworks.com

C) Major Equipments/ Instruments with Broad Specifications

1. CRO (100MHz).
2. Multimeter (3and1/2 digit digital).
3. Pattern generator.
4. Microphone of Different Types.
5. Loudspeaker.
6. Digital TV trainer.
7. Continuity tester.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		H		H						
CO2			H	H	H	M					
CO3			H	H	H	M					
CO4	H		H	H		H					
CO5	H			H		H					
CO6	H		H	H		H					
CO7	H		H	H	H	H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Digital Communication (DCO) **COURSE CODE :** 6443

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

Digital communication systems are finding extensive use in all walks of life hence an electronics and telecommunication engineer should familiar with basic concepts, systems and modulation methods used in digital communication. This course aims at familiarizing him/her with the same.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Compare Digital and Analog communication system
2. Explain different analog modulation techniques.
3. Explain different pulse code modulation techniques
4. Describe different digital carrier modulation methods.
5. Describe coding methods
6. Explain SS systems

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Compare different types of pulse code modulation techniques.
2. Select the relevant digital modulation technique for specific application.
3. Choose the coding technique for minimum errors in transmitting information.
4. Choose the relevant data transfer technique for various types of data transfer.
5. Use the relevant techniques of digital communication.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to Digital Communication**	1a. State advantages of digital communication over analog communication 1b. Draw and explain block diagram of digital communication system. 1c. State Shannon Hartley theorem and Channel capacity equation 1d. Define channel noise and explain its effect. 1e. Define entropy 1f. Numerical based on entropy and channel	1.1 Digital communication system, block diagram 1.2 Channel capacity- definition, Hartley's law, 1.3 Shannon Hartley theorem, 1.4 Channel capacity equation, 1.5 Channel noise and its effect 1.6 Entropy(definition and equation) 1.7 Advantages and disadvantages of digital communication 1.8 Comparison between analog and digital communication	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	capacity equation 1g. Advantages of digital communication		
Unit-II **Analog Pulse Modulation**	2a. State Sampling theorem and explain its different types 2b. Explain errors in sampling 2c. Explain with sketch, generation and detection of PAM, PWM & PPM signals. 2d. Compare PAM, PWM & PPM.	2.1 Sampling theorem, aliasing, Niquist rate, natural and flattop sampling 2.2 Errors in Sampling 2.3 Pulse Amplitude Modulation (PAM) 2.4 Pulse Width Modulation (PWM) 2.5 Pulse Position Modulation (PPM) 2.6 Generation, detection and comparison of PAM, PWM, PPM.	06
Unit-III **Pulse Code Modulation**	3a. State the need for digital transmission 3b. Explain the process of uniform and non-uniform quantization 3c. Explain companding 3d. Explain inter symbol interference 3e. Explain with diagram PCM, DPCM, DM & ADM transmitter and receiver	3.1 Need for digital transmission 3.2 Quantizing, Uniform and Non-uniform Quantization 3.3 Quantization Noise 3.4 Companding 3.5 Inter symbol interference 3.6 Pulse code modulation, block diagram of transmitter and receiver 3.7 Differential Pulse Code 3.8 Modulation 3.9 Delta Modulation block diagram, slope overload and granular noise 3.10 Adaptive Delta Modulation block diagram and working	08
Unit-IV **Digital Carrier Modulation Techniques**	4a. Definition of bit rate and baud rate 4b. Explain with diagram generation and reception of ASK, FSK, PSK, DPSK, QPSK and QAM 4c. Comparison of ASK, FSK, PSK, DPSK, QPSK and QAM	4.1 Block diagram of digital transmission and reception. 4.2 Information capacity, Bit Rate, Baud Rate and M-ary coding. 4.3 Amplitude Shift Keying (ASK) 4.4 Frequency Shift Keying (FSK) 4.5 Phase Shift Keying (PSK) 4.6 Binary Phase Shift Keying (BPSK) 4.7 Quadrature Phase Shift Keying (QPSK) and Differential Phase Shift Keying (DPSK) 4.8 Quadrature Amplitude modulation (QAM) 4.9 Bandwidth for each modulation techniques and their comparison	08
Unit-V **Coding Methods and Error Control**	5a. State need of line coding 5b. Explain with the help of waveforms different types of line coding methods and problems based on the same 5c. State the need of source	5.1 Line coding – Unipolar, bipolar-NRZ, RZ, Manchester Codes 5.2 Source coding viz ASCII, EBCDIC and baudot code 5.3 Channel coding: errors, causes of errors and its effects 5.4 error detection and correction	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	coding and explain different source coding methods. 5d. State types of errors 5e. Detection and correction of errors using parity, Hamming and CRC code	using parity, Hamming and CRC code 5.5 Simple numerical based on it	
Unit-VI **Multiplexing & Multiple Access Techniques**	6a. State the need of multiplexing. 6b. Describe with diagram different multiplexing techniques 6c. Compare different multiplexing techniques. 6d. Describe with a sketch different accessing techniques.	6.1 Need of Multiplexing 6.2 TDM, FDM definition, block diagram and comparison 6.3 Introduction to WDM 6.4 Concept of Frequency Division, Multiple Access (FDMA) 6.5 Code Division Multiple Access (CDMA) 6.6 Time Division Multiple Access (TDMA) 6.7 advantages of TDMA over FDMA	08
Unit-VII **Spread Spectrum Modulation**	7a. Define PN sequence. 7b. Define ML sequence and state its properties. 7c. Differentiate between direct sequence and frequency hopping spread spectrum systems. 7d. Describe with a sketch direct sequence spread spectrum and frequency hopping spread spectrum system. 7e. State applications of spread spectrum system.	7.1 Introduction 7.2 PN sequence and its generation 7.3 Model of Spread spectrum System 7.4 Direct sequence Spread spectrum signal 7.5 Frequency Hop Spread spectrum, slow frequency hopping and fast frequency hopping 7.6 Applications of spread spectrum system	06
		TOTAL	48

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction to Digital Communication	04	02	02	08
II	Analog Pulse Modulation	04	02	02	08
III	Pulse Code Modulation	04	04	04	12
IV	Digital Carrier Modulation Techniques	06	06	04	16
V	Coding Methods and Error Control	04	04	04	12
VI	Multiplexing & Multiple Access Techniques	04	04	04	12
VII	Spread spectrum modulation	04	04	04	12
	TOTAL	**30**	**26**	**24**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	II	Check the performance of Pulse Amplitude modulator and Demodulator circuit	02
2	II	Check the performance of Pulse Width modulator and Demodulator circuit	02
3	II	Check the performance of Pulse Position modulator and Demodulator circuit	02
4	III	Check the performance of Pulse code modulator and Demodulator circuit	02
5	III	Check the performance of Delta Modulator circuit	02
6	III	Check the performance of Adaptive Delta Modulator circuit	02
7	III	Check the performance of DPCM modulator circuit	02
8	IV	Check the performance of Amplitude Shift Keying modulation and demodulation	02
9	IV	Check the performance of Frequency Shift Keying modulation and demodulation	02
10	IV	Check the performance of Binary Phase Shift Keying modulation and demodulation	02
11	IV	Check the performance of Quadrature Phase Shift Keying modulation and demodulation	02
12	IV	Check the performance of Quadrature Amplitude modulation and demodulation	02
13	IV	Check the performance of Time Division Multiplexer and Demultiplexer circuit	02
14	IV	Check the performance of Frequency Division Multiplexer modulation and Demultiplexer circuit.	02
15	V	Observe the performance of Manchester coding method.	02
16	VI	To generate P-N Sequence using shift register	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Design sample and hold Circuit
2. Compare ranges of Bluetooth communication of various mobile
3. Collect technical specifications of Bluetooth headphone.
4. Industrial visit to telephone exchange and mobile switching centre

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Animation/video films showing the Principle of working, Waveforms and features of PCM/DM/ADM/DPCM and Digital Modulation Techniques should be shown to students while teaching the concerned topic.
2. Demonstrate how to transfer data through Modem, USB and Bluetooth using Mobile, Computers.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Digital Communication (2nd Edition)	R.N. Mupagi	Oxford University Press, New Delhi, Latest edition
2	Analog and Digital Communication	T. L. Singal	Tata McGraw Hill, India Latest edition
3	Modern Digital and Analog Communications Systems (3rd Edition)	B.P. Lathi	Oxford University Press, New Delhi, Latest edition
4	Communication System(Analog and Digital)	Sanjay Sharma	S.K. Kataria and Sons, New Delhi, Latest edition
5	Digital Communication	M. Kulkarni	Umesh Publications New Delhi

B) Software/Learning Websites

1. PCM/DM/ADM/DPCM and Digital Modulation Techniques generation using any simulation software.
2. MATLAB software/ Electronics work bench software for the simulation

C) Major Equipments/ Instruments with Broad Specifications

1. Digital Communication trainer kits
2. Dual trace oscilloscope
3. Function Generator

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		H			H					
CO2	M		H	H	H	H					
CO3	H		H	H	H	H					
CO4		H	H	H	H	M					
CO5	H		H	H	H	L					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Advance Communication Systems (ACS) **COURSE CODE :**6444

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

The development in telecommunication network based on Radar, Satellite, Microwave and Optical fiber technology has occurred with rapid growth. The course contents deal with basics of advanced communication systems and their maintenance.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand concepts and applications of microwave and optical spectrum.
2. Understand construction and working of microwave components and devices.
3. Understand basic principle and operation of radar systems.
4. Understand the construction, working and uses of optical communication system components.
5. Know the concept, working and application of satellite communication system.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Describe the construction and operation of microwave devices.
2. State the applications of microwave devices.
3. Explain with block diagram and operation of different types of radar and satellite communication system.
4. Explain construction and working principle of different types of optical sources and detectors used in optical fiber communication.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Basics of Microwaves and Wave Guides**	1a. Need of microwave communication system. 1b. Compare waveguide and two wire transmission line. 1c. Explain propagation of wave in rectangular waveguide. 1d. Define TEM/TE/TM, cut off frequency of a waveguide, guide wave length, phase velocity, group velocity.	1.1 Introduction to TEM/TE/TM wave. 1.2 Comparison between wave guide and two -wire transmission line. 1.3 Propagation of waves in rectangular wave guide only. (Introduction to wave guide only) 1.4 Construction and applications of Circular waveguide and rectangular waveguide. 1.5 Definition and interpretation of cut off frequency of a waveguide, guide wave length, phase velocity, group velocity. (Simple Numerical)	06
Unit-II **Microwave**	2a. State principle and draw construction of two cavity Klystron, Reflex	2.1 Construction, working Principles and Applications of: Two cavity klystron amplifier, Reflex Klystron	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Components and Devices	Klystron amplifier and travelling wave tube (TWT). 2b. Draw constructional sketch and explain working of PIN and Tunnel and Gunn diode. 2c. Explain bends and corners, Twists. 2d. Draw and explain working of H- plane TEE, E-Plane and E-H-Plane TEE, directional coupler, waveguide, circulator and Isolator.	amplifier, travelling wave tube. 2.2 Construction and working principle and Applications of microwave Diodes: PIN, Tunnel and Gunn. 2.3 Construction, Working principle and applications of: H- plane TEE, E-Plane TEE, E-H Plane TEE, Multihole directional coupler, wave guide bends, corners, Twists, circulator and isolator.	
Unit-III **RADAR**	3a. Explain operation of pulse radar, MTI and CW radar system. 3b. Draw and explain working principle of Duplexer. 3c. Significance of Doppler effect 3d. Enlist applications of RADAR.	3.1 Fundamentals: Basic concept of Radar, Block diagram of an elementary pulsed Radar, Duplexer concept 3.2 Concept of continuous Wave Radar, Doppler effect and Speed Measurement 3.3 Block diagram and operation of Moving target indicator (MTI) radar 3.4 Applications of Radar	08
Unit-IV **Satellite Communication System**	4a. Draw and explain generalized block diagram of satellite communication system. 4b. Draw block diagram of various subsystems of satellite. 4c. State uplink-downlink frequencies for various bands 4d. Draw and explain operation of transponder. 4e. Enlist the applications of satellite.	4.1 Introduction to satellite communication system 4.2 Generalized block diagram of satellite communication system. Concept of orbit and its types 4.3 Communication link : uplink and downlink frequency, look angle altitude, elevation angle, Azimuth angle footprint and station Keeping 4.4 Block diagram and Principle of subsystem of satellite : Power subsystem, Communication channel subsystem (Block diagram of typical transponder), Attitude control subsystem, Telemetry tracking and command subsystem, Main and auxiliary propulsion subsystem, Antenna subsystem 4.5 Satellite applications	08
Unit-V **Fundamentals of Fiber Optic Communication**	5a. Draw constructional sketch of fiber optic cable. 5b. Classify and explain optical fibers. 5c. State advantages and disadvantages of optical fiber cable. 5d. Enlist applications of	5.1 Block Diagram of Fiber Optic Communication. 5.2 Construction of Fiber Optic Cable 5.3 Fiber Classification: Single- Mode Step Index, Multi -mode Step-Index, Multi-mode Graded Index 5.4 Advantage and disadvantages of fiber optic communication. 5.5 Applications of FOC.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	FOC.		
Unit-VI **Fiber Optic Communication system**	6a. Define reflection, dispersion, diffraction, absorption, scattering, Snell's Law, Numerical Aperture / Acceptance angle, acceptance cone, critical Angle. 6b. Explain construction and operation of LED and Laser 6c. Explain construction and operation of PIN and avalanche Photo diode. 6d. Explain splicing Techniques 6e. Know causes of losses in fiber optic system and minimize them. 6f. Draw and explain block diagram of OTDR.	6.1 Definition and Concept of Reflection, dispersion, diffraction, absorption and scattering with the help of light theory 6.2 Definitions of Snell's Law, Numerical Aperture / Acceptance angle, acceptance cone, Critical Angle (Numerical) 6.3 Optical Sources: Construction and working Principle of LED and LASER 6.4 Optical Detectors: Construction and working principle of PIN Diode, Avalanche photodiode (APD) 6.5 Splicing Techniques: Fusion, Mechanical. 6.6 Losses in optical fiber: Absorption, Scattering, Dispersion, Radiation, Coupling. 6.7 Block diagram and working of OTDR	10
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Basics of Microwaves and Waveguides	06	02	02	10
II	Microwave Components and Devices	06	06	02	14
III	RADAR	04	06	02	12
IV	Satellite Communication System	06	08	02	16
V	Fundamentals of Fibre Optic Communication	06	06	00	12
VI	Fibre Optic Communication system	06	08	02	16
	TOTAL	**34**	**36**	**10**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	II	Assemble microwave bench using microwave components.	04
2	II	Measure VSWR for given microwave loads	04
3	IV	Transmit audio over satellite link.	02
4	IV	Transmit data over satellite link.	02
5	V	Plot V-I characteristic of photo-diode (Detector) at different luminance	02
6	V	Plot (i) V-I characteristic of LED (ii) Characteristics of the output light intensity against forward current of LED	02
7	V	Assemble and verify analog link using optical fiber.	02
8	V	Assemble and verify digital link using optical fiber.	02
9	VI	Calculate the Numerical Aperture(NA) of given optical fiber by using Trigonometric method (visual method)	02
10	VI	Measure the bend loss and attenuation in given fiber optic cable using OTDR	04
11	VI	Industrial visit to Telephone exchange.	06
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare chart showing various microwave components.
2. Prepare/Download a dynamic animation to illustrate the following:
    a. Microwave tubes.
    b. EM waves propagation.
3. Visit any one of the following where waveguides are used for microwave communication. (Airport, earth station, Telephone exchange, Microwave link repeater, TV broadcast).
4. Download various information about satellite launched with their applications.
5. Collect information about RADAR used by Indian military and navigation operation.
6. Visit a place where optical fibers are used for various applications. (Collect information about OTDR at their locations).

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video to demonstrate the working principles, constructional features, testing and understandings of different types of microwave devices, OFC, RADAR, Satellite.
2. Arrange a visit to any communication exchange.
3. Arrange expert lecture of an industry person in the area of advance communication.
4. Encourage students to build communication circuits.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Microwave Engineering	Gupta Sanjeeva	Khanna Publication, New Delhi
2	Electronics communication system	Kennedy George	Tata McGraw hill, New Delhi
3	Microwave engineering	Das Annapurna and Das S. K	McGraw Hill, New Delhi,
4	Microwave Devices and Circuits	Liao Samuel Y.	PHI Learning, New Delhi
5	Microwave and RADAR Engineering	Gautam A. K	S K Kataria Publications, New Delhi
6	Optical Fiber Communications	Senior	PHI Learning, New Delhi,
7	Optical Fiber Communication	Gred Keiser	Tata McGraw Hill

B) Software/Learning Websites

1. RF Tool box: MATLAB and SIMULINK:
2. http://www.rfmw.org/transmission_lines_and_distributed_systems_trans mission_lines_transmission _lines.html
3. http://www.rfmw.org/transmission_lines_and_distributed_systems_transmission_line s_transmission _lines_video_lectures.html www.nptel.ac.in

C) Major Equipments/ Instruments with Broad Specifications

a.	Transmission line trainer.	
b.	Gunn / klystron power supply	'X' band
c.	VSWR meter	Resonated at 01 KHZ
d.	Microwave bench(Gunn / klystron)	'X' band component.
e.	Microwave accessories	BNC to BNC cables, Main Chords.
f.	Microwave components	'X' band
g.	Radar trainer kit	Microwave X band frequency range

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		H	H	H	M					
CO2	H	M			M						
CO3	H		H	H	H	M					
CO4	H		H	H	H	M					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : .NET Technology (NTT) **COURSE CODE** : 6445

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	04	05	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

This course introduce the "Rapid Application Development (RAD) for the common business application, using Graphical User Interface (GUI)

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the terms related to VB.NET Development and VB.NET applications.
2. Understand the data types, loops and importance of the Error Handling, its methods and event.
3. Importance of OOO's concept and describe its classes.
4. Define windows forms and State the different controls
5. Define database concept
6. Define Database Connections

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. State importance of VB.NET Development and applications.
2. Explain data types and uses of loops and importance of theError Handling, its methods and event.
3. Suggest OOO's concept and describe its classes.
4. Describe windows forms and State the different controls
5. Explain Concept of database concept
6. Explain Concept of Database Connections

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Introduction to VB.net**	1a. Define the terms related to VB.NET Development Environment Studies 1b. State importance of creating VB.NET applications	1.1 Event Driven Programming 1.2 .NET Framework 1.3 .NET Architecture 1.4 The Just-In-Time Compiler 1.5 .NET Framework class library introduction 1.6 VB.NET Development Environment - Creating Applications - Building Projects - Using simple components - Running VB.NET applications
Unit-II **Implementation of VB.NET**	2a. Define data types, loops 2b. Importance of Error Handling, it's methods and event	2.1 Features 2.2 VB.NET IDE 2.3 Data types 2.4 Operators 2.5 Loops

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		2.6 Control Structures 2.7 Cases 2.8 Error Handling 2.9 methods and events
Unit-III **Object Oriented Programming in VB.NET**	3a. Define OOO's concept 3b. Describe it's classes	3.1 Introduction to OOP - Advantages & Disadvantages 3.2 Basic Concept Of OOP - Classes & Objects - Constructors and Destructors - Method overloading - Overloading and Overriding. - Inheritance - Indexer - Access modifiers: - Public, Private, Protected, Friend.
Unit-IV **Windows Applications in VB.NET.**	4a. Define forms 4b. State the different controls	4.1 Windows Forms 4.2 Controls - Text Boxes, Buttons, Labels, Check Boxes and Radio Buttons - List Boxes, Combo Boxes. Picture Boxes, Scrollbars, Splitters, Timer - Menus, Built-in Dialogs - Image List, Progress bars.
Unit-V **Databases in VB.NET**	5a. Define database concept 5b. Define Database Connections	5.1 Database - Connections - Data adapters - Datasets - Data Reader, 5.2 Connection to database with server explorer 5.3 Multiple Table Connection 5.4 Data binding with controls like Text Boxes, List Boxes, Data grid etc. 5.5 Navigating data source 5.6 Data Grid View

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Any Five Visits and Five Reports/Assignments)	Approx. Hrs. required
1	I-IV	Create a simple Console Application using VB.NET(addition of two no, select case)	06
2	I-IV	Create Windows Application using VB.NET controls (simple calculator)	08
3	I-IV	Create Window Application using Class.	06
4	I-IV	Create Window Application using Built in Dialogs	06
5	I-IV	Apply Interface on Windows Application Form	08
6	I-IV	Create Window Application using combo box	06
7	I-IV	Create Window Application using list box	06

S. No.	Unit No.	Practical Exercises (Any Five Visits and Five Reports/Assignments)	Approx. Hrs. required
8	I-IV	Create Window Application using Timer	06
9	I-IV	Create Window Application using Progress bar	06
10	I-V	Create Window Application for access database.	06
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Create console application using VB.NET and its different controls
2. Create a user friendly application.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Course Video
2. Expert Lectures

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Programming Microsoft Visual Basic.NET	Francesco Balena	Microsoft Press
2	The Complete Reference -Visual Basic NET	Jefrey R. Shapiro	Osborne/McGraw Hill
3	Murach's VB.NET database programming with ADO.	Anne Prince and Doug Low	Murach
4	The Visual Basic.NET COACH	Jelf Salvage	Addison Wesley
5	Visual Basic.NET 2003 in 21 Days	Steven Holzner	SAMS Publications

B) Software/Learning Websites

1. http://www.vbtutor.net/vb_sample/sample.html
2. http://www.worldbestlearningcenter.com/index_files/VB.NET-variables-exercises.htm
3. http://www.homeandlearn.co.uk/NET/nets1p24.html

C) Major Equipments/ Instruments with Broad Specifications

1. VB.Net min requirement 2008 and onwards versions
2. Computers -HDD: 40GB Processor: PIV or above Min RAM: 2GB or above OS: 32 bit or 64 bit

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1									M		M
CO2	H	L			M						
CO3	H					H	L				
CO4		H	M						M		M
CO5	H			M	M	H		M		M	
CO6									L		M

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Microcontroller-8051 (MIC) **COURSE CODE :** 6552

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

An electronics engineer working in an industry is required to make use of micro controller programming for various applications. The objective of this course is to enable the student to use micro controller for variety of industrial application. The technology of microprocessor has led to a single chip Microcontroller technology MCS- 51 family architecture, details of 8051 Microcontroller and its programming is covered in this course use of assembler and simulator for programming of Microcontroller will make the students equipped for the development of embedded systems.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Compare Microprocessor and Microcontroller.
2. Describe architecture and operation of microcontroller 8051.
3. Know various program development tools.
4. Develop assembly language programs using instruction set of 8051.
5. Interface peripheral with microcontroller 8051.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Select appropriate version of microcontroller for different application.
2. Use software program development tool.
3. Write and execute assembly language program for specific application.
4. Interface input/output peripherals with microcontroller 8051.
5. Develop small microcontroller based application.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to Microcontroller**	1a. Compare microprocessor and microcontroller. 1b. Differentiate between microcontroller architectures. 1c. Compare versions of microcontrollers. 1d. Explain generalized block diagram of microcontroller.	1.1 Introduction and History of microcontroller. 1.2 Comparison of Microprocessor, Microcontroller. 1.3 Evaluation of Microcontroller 1.4 Terminology: RISC, CISC, Harvard and Von-Neumann Architecture and their comparison. 1.5 Generalized functional block diagram of microcontroller. 1.6 Specification and comparison of 8051, 8751 and 8951	08
Unit-II	2a. State features of 8051 microcontroller.	2.1 Features and Pin diagram with function of all pins of 8051.	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
8051 Hardware	2b. Draw pin diagram and architecture of 8051. 2c. Explain pin functions and architecture of 8051. 2d. Interface external memory with microcontroller. 2e. Draw internal port structure of 8051. 2f. Explain operation of input/output ports of 8051.	2.2 Architecture of 8051. 2.3 Function of program counter and data pointer, A and B registers, Program status word (PSW) register, concept of Stack and stack pointer register, List of special function registers with address 2.4 Internal Memory: Concept and Structure of 128 byte internal RAM, Structure of 4kb EPROM. 2.5 Connections of external memory. 2.6 Port Structure: Internal diagram and working of all four ports.	
Unit-III **Addressing modes and instruction set**	3a. Define addressing modes of instructions. 3b. Explain functions of all assembly language instructions of 8051. 3c. Develop assembly language program for different operations.	3.1 8051 Addressing modes-Definition and types. 3.2 Assembly language instruction format. 3.3 8051 Instruction Set-Data transfer, Arithmetic, Logical, Branch-jump and Call Instructions, Boolean variable manipulation instructions. 3.4 Simple Programming: 8-bit addition, subtraction, multiplication, division (using external memory) largest number, ascending order, block transfer (external to internal memory), to find even and odd numbers.	14
Unit-IV **Assembly program development tools**	4a. Differentiate between different software development tools. 4b. Define different data types and explain assembler directives. 4c. Explain various files in software tools. 4d. Use different software simulators.	4.1 Development systems tools- Editor, Assembler, Linker, Debugger 4.2 8051 data types-Decimal, Hex and Binary. 4.3 Directives (DB, DW, BIT, ORG, EQU, END) 4.4 Creating various files to run the 8051 program (asm, obj, lst, abs and hex files) 4.5 Software Simulators of 8051 (MIDE-51, Keil's Tool, µvision debugger)	10
Unit-V **SFR format and programming**	5a. Draw format of all special function registers. 5b. Explain function of each bit of each special function register. 5c. Write program to generate a square wave. 5d. Explain serial communication with simple program	5.1 Interrupts- IE and IP SFRs study. 5.2 Study of Timer SFR's (TMOD, TCON, TLX, THX) 5.3 Timer modes of 8051 5.4 Programming of 8051 timers-Generation of square wave using timer modes, calculation of count and assembly program. 5.5 Serial communication. (SCON), simple program for serial communication. 5.6 Power saving mode of 8051 study	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	5e. Explain power saving options of microcontroller.	of PCON	
Unit-VI **Peripheral Interfacing and Programming**	6a. Draw Interface diagram and explain interfacing of peripherals with 8051 such as ADC, DAC, Keyboard, LEDs, 7-segment and LCD display, DC and Stepper Motor. 6b. Develop assembly language program to use peripherals with 8051 such as ADC, DAC, Keyboard, LEDs, 7-segment and LCD display, DC and Stepper Motor.	6.1 ADC 0808/0809 interfacing and programming 6.2 DAC 0808 Interfacing -Generation of Square wave, Triangular wave 6.3 Keyboard Interfacing (simple program) 6.4 Interfacing and programming of LEDs. 6.5 Interfacing and programming of 7-segment. 6.6 LCD interfacing- Initialization, programming. 6.7 DC and Stepper motor interfacing with Programs.	12
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Introduction to Microcontroller	04	04	00	08
II	8051 Hardware	08	04	00	12
III	Addressing modes and instruction set	04	04	08	16
IV	Assembly program development tools	02	04	04	10
V	SFR format and programming	04	04	08	16
VI	Peripheral Interfacing and Programming	02	04	12	18
	TOTAL	**24**	**24**	**32**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	II	Study of Pin diagram and architecture of 8051.	02
2	III	Write and execute assembly program using simulator 8-bit addition and 8-bit subtraction using internal memory.	04
3	III	Write and execute assembly program using simulator 8-bit Multiplication and 8-bit Division using external memory.	04
4	III	Write and execute assembly program to find largest number from group of 10 numbers using simulator	02
5	III	Write and execute assembly program to find smallest number from group of 10 numbers using simulator	02
6	III	Write and execute assembly program to find Even and odd number from group of 10 numbers using simulator (two separate programs)	04
7	III	Write and execute assembly program to arrange 5 numbers in descending using simulator	02
8	III	Write and execute assembly program to arrange 5 numbers in ascending using simulator	02
9	III	Write and execute assembly program to transfer 10 numbers from external memory to internal memory using simulator.	02
10	III	Write and execute assembly program to transfer 10 numbers from external memory to external memory (overlapped) using simulator.	02
11	V	Write, execute and download on kit assembly program to generate square waveform using internal timers.	02
12	VI	Write, execute and download on kit assembly program to interface and blink LEDs on I/O ports.(two different patterns of blinking)	04
13	VI	Write, execute and download on kit assembly program to interface (16x2) LCD and display message on it.	04
14	VI	Write, execute and download on kit assembly program to interface 7-segment and display BCD-counter on it.	04
15	VI	Write, execute and download on kit assembly program to interface DAC0808 and Generate Triangular waveform.	04
16	VI	Write, execute and download on kit assembly program to interface stepper motor and to rotate it in clockwise and anticlockwise direction.	04
17	VI	Write, execute and download on kit assembly program to interface and rotate DC motor in forward and reverse directions.	04
18	VI	Write, execute and download on kit assembly program to interface 4-keys and display it on LEDs.	04
19	VI	Write, execute and download on kit assembly program to implement simple traffic light control system.	04
20	VI	Write, execute and download on kit assembly program to interface ADC809 and display digital value.	04
TOTAL			**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare a chart of architecture of 8051.
2. Prepare a chart showing all instructions of 8051.
3. Prepare chart to represent the interfacing diagram of microcontroller with different peripherals.
4. Develop a practical application using 8051 Microcontroller
5. Prepare/Download a dynamic animation to illustrate the following

a. Data transfer operation
b. Keypad Interfacing
c. LCD Interfacing
d. Stepper / DC Motor Interfacing

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video/animation film to demonstrate the working of microcontroller.
2. Arrange expert lecture of a person in the area of Microcontroller.
3. Arrange visit to relevant industry.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	The 8051 Microcontroller Architecture, Programming and Application	Kennneth J. Ayala	Thomson and Delmar Learning. (PRI), Second Edition.
2	The 8051 Microcontroller and Embedded systems	Mazidi, Mazidi and Mckinlay	Pearson Publication, Second Edition.
3	Microcontrollers	Ajay Deshmukh	Tata-McGraw Hill Publication, first Edition.
4	Programming and Customizing the 8051 microcontroller	Myke Predko	Tata-McGraw Hill Publication 1999.

B) Software/Learning Websites

1. www.8052.com
2. www.nptel.iitm.ac.in

C) Major Equipments/ Instruments with Broad Specifications

1. 8051 Microcontroller Trainer Kit.
2. 8051 Simulator Software (Web version)
3. Computer system (Latest version)
4. Peripheral interface kits
5. 8051 microcontroller programmer.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	L									
CO2						H					
CO3	L			H	L						
CO4	L		L	H							
CO5	L			H					L	L	

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Control System and PLC (CSP) **COURSE CODE** : 6553

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

This course deals with basic mathematical concepts in designing and maintaining the control system, control system components & basics of PLC.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the concept of control and control system
2. Understand Steady state, time domain and frequency domain analysis of control system
3. Understand the concept of stability
4. Know the concept of different Servo Systems and control system component
5. Understand the basic concept of PLC

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Develop transfer functions of 1^{st} and 2^{nd} order of system
2. Interpret functionality of different control system components
3. Calculate time response specifications for different control system
4. Identify the significance of standard test inputs and apply them in analysis of control system
5. Compute stability of a control system using analytical and graphical methods
6. Explain the major components of PLC

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction of Control System**	1a. Define control system 1b. Differentiate open loop and close loop system, Linear and non- linear system, Time varying and time in-varying Systems 1c. Design transfer function of electronic circuits 1d. Plot pole and zeros on s-plane for a transfer function 1e. Develop and solve block diagram of a closed loop control system 1f. Apply signal flow graph reduction rules to closed loop control system	1.1 Definitions of control system 1.2 Classification of control systems 1.3 Open loop and closed loop systems – definition, block diagram, practical examples and Comparison 1.4 Linear and non- linear system, Time varying and time in-varying Systems 1.5 Laplace transform – Significance in Control System. 1.6 Transfer function – definition, derivation of transfer Function for close loop control system, Transfer functions of simple RC and RLC electrical circuits. Laplace transform of transfer function. 1.7 Poles and zeros: Definition, S-	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		plane representation 1.8 Order of a system – definition, 0, 1, 2 order system standard equation, practical examples 1.9 Block diagram reduction technique: Need, reduction rules, Numericals.	
Unit-II **Control System Components and Servo Systems**	2a. Define servo system 2b. Draw the block diagram of servo system 2c. Explain principle and basic concept of AC and DC servo systems 2d. Compare AC and DC servo system 2e. Explain different servo components 2f. Describe the operation of variable reluctance type Stepper motor 2g. Explain the operation of AC/DC servo motors 2h. Compare armature controlled and field controlled DC servo motors 2i. Interpret the characteristics of servo system, servo components, AC/DC servo motors	2.1 Servo system –definition, block diagram 2.2 AC and DC servo systems-concept and principle, comparison, practical example, schematic diagram 2.3 Servo components • Potentiometer as error detector • Synchro as error detector • Rotary encoder 2.4 Stepper motor- variable reluctance type 2.5 DC servo motor- characteristic, comparison between armature controlled and field controlled DC servo motors (no TF) 2.6 AC servo motor- characteristic of AC Servo motor (no TF)	08
Unit-III **Time Domain Analysis of Control System**	3a. State different standard inputs and their Laplace transform 3b. Compute time response of first order system 3c. Analyze steady state error and error coefficients 3d. Define time response specifications 3e. Solve numericals on time domain analysis	3.1 Standard test inputs: Step, ramp, parabolic and impulse, Need, significance and corresponding Laplace representation 3.2 Time response of first order system for step input, ramp input, parabolic input. 3.3 Analysis of steady state error and error coefficients. 3.4 Time response specification like delay time, rise time, peak time, peak overshoot, damping ratio, steady state error. (no derivations) 3.5 Numericals based on above topics	08
Unit-IV **Stability Analysis of Control System**	4a. Define stability 4b. Explain conditions for stability 4c. Differentiate Stable, unstable, critically stable and conditionally stable system 4d. Determine stability of system using Hurwitz and Rouths	4.1 Stability: Definition of stability, Necessary condition for stability. 4.2 Analysis of Stable, unstable, critically stable and conditionally stable system, Relative stability, Root locations in s-plane. 4.3 Hurwitz stability criterion 4.4 Rouths stability criterion 4.5 Numericals based on above topics	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	stability criterion.		
Unit-V **Frequency domain Analysis of Control System**	5a. Explain advantages and disadvantages of frequency response analysis 5b. State frequency response Specifications 5c. Develop Bode plot method for standard function for calculation of gain and phase margin 5d. Compare time domain and frequency domain analysis.	5.1 Introduction, Advantages and Disadvantages of Frequency Response Analysis 5.2 Frequency Response Specifications. 5.3 Bode Plot method for Standard Function: Introduction of Bode plot, Gain plot, Phase plot. 5.4 General Procedure for Constructing Bode Plot. 5.5 Comparison between time domain and frequency domain analysis. 5.6 Numericals based on above topics	08
Unit-VI **Introduction to programmable logic controllers**	6a. Draw block diagram of PLC. 6b. Describe PLC architecture. 6c. Explain the working of PLC. 6d. List the steps to configure the PLC. 6e. List out peripherals for PLC 6f. Draw basic symbols used for PLC. 6g. Describe selection criteria for PLC. 6h. State advantages and Disadvantages of PLC. 6i. List out PLC applications in industries and automation systems.	6.1 Introduction to PLC 6.2 Configuration of PLC (components of modularized PLC) 6.3 Architecture of PLC 6.4 Working of PLC 6.5 PLC peripherals 6.6 PLC symbols 6.7 Selection criteria of PLC 6.8 Advantages and disadvantages of PLC 6.9 PLC applications.	08
		TOTAL	**48**

5.0 SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction of Control System	06	06	06	16
II	Control System Components and Servo Systems	04	04	06	14
III	Time Domain Analysis of Control System	04	06	04	14
IV	Stability Analysis of Control System	04	04	04	12
V	Frequency domain Analysis of Control System	04	04	04	12
VI	Introduction to programmable logic controllers	04	02	06	12
	TOTAL	**26**	**26**	**28**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Check the performance of any close loop control system	02
2	I	Verify and analyze the Step response of first order R-C circuit	02
3	I	Verify and analyze the Step response of R-L-C second order circuit	02
4	II	Assemble and check the performance of potentiometer as error detector	02
5	II	Assemble and check the performance of Synchro as error detector	02
6	II	Test the performance of DC position control system	02
7	II	Test the performance of AC servomotor	02
8	II	Test the performance of DC servomotor	02
9	II	Test the performance stepper motor	02
10	III	Assemble and determine time response specifications of first order control system (using passive components)	04
11	V	Calculate gain and phase margins for a transfer function using Bode plot method	02
12	VI	Identify the different subsections of PLC architecture	04
13	VI	Assemble various modules of PLC to make PLC system	04
TOTAL			**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Identify different examples of control systems used in day-to-day life.
2. Collect the specifications of different control system components.
3. Interface different transducers to the available PLC module in the laboratory.
4. Collect the information and specifications of PLCs of different manufacturers.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Arrange industrial visit.
2. Expert lecture from industrial experts OR academicians.
3. Show videos /power point presentation from renowned experts in the area of control system & PLC.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Control System Engineering	I.J. Nagrath, M. Gopal	Wiley Eastern
2	Modern Control Engineering	K. Ogata	Prentice Hall
3	Intro. To Programmable logic control	Gary Dunning	Cenage Learning
4	Programmable logic controllers	F.D. Petruzella	Tata- McGraw-Hill(Third edition)

B) Software/Learning Websites

1. http://www.pacontrol.com
2. http://en. wikipedia.org/wiki/Control_system
3. www.learningpit.com-for PLC simulation software downloading.
4. www.plctutor.com - for PLC tutorials

C) Major Equipments/ Instruments with Broad Specifications

1 **DC Regulated dual Power supply**.

1. O/P voltage – 0 to 30 Volt, 2A in 3 range in both channel
2. Display – 3 ½ digit,
3. Load regulation – 0.5 V % + 10 mV, no load full load for each channel
4. Line regulation – 0.05 % + 15 mV for +/-, Variation around 230 volt
5. O/P imp – 15 milliohms,
6. Ripple – less than 1mV rms.
7. I/P supply – 230 V +/- 10 % 50 Hz.
8. Both channel tracking mode

2 Function generator 3MHz.

1. Out Put wave form – Sine, Triangle, Square.
2. Frequency range – 0.1 Hz to 3 MHz
3. Amplitude Range – 30mV to 30 Volt P- P,
4. O/P impedance – 50 V.
5. offset capability,
6. Display – 4 digit LED/ LCD

3 Pulse Generator.

1. Pulse repetition rate – 0.1 Hz to 10 MHz in 8 decade ranges.
2. Rise and fall time – 10 ns - 2 ns
3. Pulse width – 35 ns and 0.1 µsec to 1 sec in y decade range
4. O/P – 40 mV to 5 V across 50 Ω in six step,
5. Power supply – 230 V +/- 10 % 50 Hz.

4 CRO

1. Dual Channel, 4 Trace CRT / TFT based
2. Bandwidth 20 MHz/30 MHz
3. X10 magnification 20 nS max sweep rate,
4. Alternate triggering
5. Component tester
6. Digital Read out0
7. USB interface
8. (Any other Oscilloscope with additional features are also suitable)

5 Demonstration kits

1. Demonstration kit for potentiometer as error detector
2. Demonstration kit for Synchro as error detector
3. Demonstration kit for DC position control system.
4. Demonstration kit for AC servomotor
5. Demonstration kit for DC servomotor
6. Demonstration kit for Stepper motor
7. PLC trainer kit

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		H	H	M	M					
CO2	H		M	M	H	M					
CO3	H	M	H	H							
CO4	H	M	H	H		M					
CO5	H		H	H		M					
CO6	H		H	H		M					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Computer Hardware and Networking (CHN) **COURSE CODE :** 6554

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	50	175
					Min.	32	--	40	--	10	20	--

1.0 RATIONALE:

The aim of the course is to teach the basic working of the computer motherboard, peripherals and add-on cards. The course helps the students to do the maintenance of the Computer, peripherals and its add-on cards. The students will be able to select the proper peripheral as per their specification and requirement. The student will be able to do assemble a Computer and also he/she is able to install software like Operating System, Application Packages and Device Drivers. The main aim of this course to make a student having well known knowledge of all Hardware devices and their functions, Troubleshooting & Repairing of Faults.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand principle, construction, working of computer peripherals.
2. Select cost effective, good quality reliable peripherals and equipment.
3. Identify the problem as hardware or software related.
4. Identify and repair the simple faults in computer systems.
5. Plan, analyze, design, install, configure, test, implement and maintain networking systems

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain motherboard and its peripherals.
2. Explain different types of power supply and its interfaces.
3. Solve, diagnose, test and maintenance of pc.
4. Explain basic concept of networking.
5. Explain all networking devices and reference models.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Motherboard And Peripherals**	1a. Identify different components and their function on motherboard 1b. Identify and compare storage devices. 1c. Write specifications, select appropriate monitor and compare LCD and CRT monitors 1d. Understand principle, construction and working of peripherals	1.1 Different types of PC configurations and their comparison. Chipset basic, Architecture of Intel 945 G 1.2 Overview and features of ISA, PCI-X, PCI-Xpress 1.3 Overview features and types of DDR RAMs, Concept of cache memory : Internal cache, External cache (L1, L2, L3 cache), BIOS Basics 1.4 CD/DVD ROM drive : Construction, recording, comparison 1.5 LCD monitor: functional block diagram of LCD monitor, working principle, Types-	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Passive matrix and Active matrix. Important characteristics - Resolution, Refresh rate, Response time. Comparison of CRT display and LCD display 1.6 Construction, working & Installation of Keyboard, mouse, scanner and printer. Keyboard: Membrane and mechanical only. Mouse: Optical only, Scanner: Flatbed only, Printer: Dot matrix, Inkjet and Laser only	
Unit-II **Power Supply And Interfaces**	2a. Select, identify, measure and troubleshoot power related problems 2b. Differentiate online and offline UPS. 2c. Identify, select and use different interfaces	2.1 Block diagram and working of SMPS, Signal description and pin diagram of ATX power supply. 2.2 UPS : Block diagram working, Types, Rating 2.3 USB features and operation, RS232: Voltages & 9 pin Signal description.	08
Unit-III **Diagnostic, Testing And Maintenance**	3a. Identify importance of preventive maintenance 3b. Realize the need of practices of preventive Maintenance of peripheral	3.1 Maintenance : Preventive and passive maintenance 3.2 Preventive maintenance of peripherals of PCs: Mouse, keyboard, hard disk, CDROM drive, laser printer, scanner. 3.3 PC problems and troubleshooting, POST.	10
Unit-IV **Introduction To Networks**	4a. Classify types of networks 4b. Plan and design network 4c. Install, configure and use networking devices 4d. Test and maintain networks	4.1 Network classification: LAN, WAN, MAN. Peer to peer and client server networks 4.2 Network topology, Benefits of networks 4.3 Network cables- coaxial, UTP, STP, fiber optics their comparison and characteristics 4.4 Network standards- Ethernet, Ring, Token, wireless	10
Unit-V **Networking Devices And Reference Models**	5a. Understand layered approach 5b. Compare TCP-IP and OSI models 5c. Setup and configure network in laboratory environment	5.1 OSI Reference Model - Interlayer Communication – Data Encapsulation, Functions of each layer. 5.2 TCP/IP Reference Model - Link, Internet, Transport, Application layer. 5.3 Comparison of the OSI and TCP/IP reference models 5.4 TCP/IP Protocols - IP, ICMP, ARP, TCP, FTP and UDP. 5.5 IP Addressing - IP Address Assignments, IP Address Classes, Subnet Masking. 5.6 TCP/IP Configuration - Installing the TCP/IP Protocol; Configuring TCP/IP - Configuring Basic TCP/IP Properties, Configuring Advanced TCP/IP Properties	10
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Motherboard And Peripherals	05	05	06	16
II	Power Supply And Interfaces	05	05	06	16
III	Diagnostic, Testing And Maintenance	05	05	06	16
IV	Introduction To Networks	05	05	06	16
V	Networking Devices And Reference Models	05	05	06	16
	TOTAL	**25**	**25**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hrs. required
1	I	Drawing the motherboard layout of Pentium IV and studying the chipset through data books or Internet.	02
2	I	Understand different components of Hard Disks drive as a storage device & terms related to it.	02
3	I	Understand formatting and partitioning of Hard Disk.	02
4	II	Identify and Install various types of Display Adapters.	02
5	II	Installation of Scanner, Printers and Modems.	04
6	III	Understand the ATX Power Supply and SMPS.	04
7	III	Use of Diagnostic Softwares. (Any one)	04
8	IV	Indentify and understand different types of Network Cable.	04
9	IV	Installation of Client Server Network in Lab.	04
10	V	RS232C communication between two computers	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Visit to industry and collect data about PC and Hardware
2. Collect information about and hardware of PC and other resources
3. PC Assembling

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Computer hardware parts
2. Arrange visit to hardware industry
3. Arrange expert seminar of industry person in the hardware area.

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	The Complete PC Upgrade & Maintenance Guide	Mark Minasi	Willey Publication
2	Upgrading & Repairing PCs	Scott Mueller	Pearson Education
3	Bigelow's Troubleshooting, Maintaining & Repairing PCs	Bigelow	Tata McGraw Hill
4	Local and metropolitan Area Networks 6/e	William Stalling	Pearson
5	Computer Networks and Internet	Douglas E Comer & M S Narayanan	Pearson

B) Software/Learning Websites

1. http://ccna.com/ccna-training
2. http://learningnetwork.cisco.com
3. http://www.mcse-training.com
4. http://www.microsoft.com/learning/en/us/certification/mcse.aspx
5. http://www.intel.com/products/processor
6. http://www.intel.com/products/desktop/motherboard
7. http://www.seagate.com
8. http://www.scsisource.com
9. http://www.w3schools.com/tcpip
10. http://www.protocols.com
11. http://www.karbosguide.com/
12. http://www.karbosguide.com/books/pcarchitecture/start.Htm
13. http://en.wikipedia.org/wiki/Computer_hardware

C) Major Equipments/ Instruments with Broad Specifications

Sr. No.	Equipments		Specifications
1	Hardware:	Desktop Computer	Processor: intel core i5 Memory: at least 4GB RAM Hard drive: at least 320GB hard disk
2		LCD Projector	Display Type: LCD Light Output: 3200 Lumens
3	Software:	Windows	**Windows 7, 10 or Higher**
4		Linux	Linux
5		Drivers	Drivers for Desktop Computers

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H			H				M			
CO2		H			M	L				L	
CO3	H						M	M			
CO4		M	H		L						L
CO5			H			M			L		

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and telecommunication Engineering (EL)

COURSE : Data Communication and Networking (DCM) **COURSE CODE** : 6555

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

After understanding basic communication system it is worth to discuss Data Communication & Networking. Telecommunication & Data communication is fastest growing technology & undoubtedly has strong growth in future so we should know data transfer from one system to another system through different communication networks like WAN, MAN & different switching techniques.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Draw OSI model and explain each layer
2. Explain TCP/IP model and functions of the different layers
3. Describe different topologies
4. Describe concept of Routing and switching
5. Describe IPv4 and IPv6 in detail

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Draw OSI model and explain each layer
2. Use TCP/IP model and functions of the different layers
3. Select appropriate topology
4. Apply concept of Routing and switching
5. Implement IPv4 and IPv6 protocol in detail

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Networking Fundamentals**	1a. Differentiate between data and information. 1b. Different forms of data 1c. Characteristics of data communication 1d. Components of a data communication system 1e. Classification of computer networks. 1f. Explain protocols in details.	1.1 Data and Information 1.2 Data Communication 1.3 Characteristics of Data Communication 1.4 Components of Data Communication 1.5 Data Representation 1.6 Data Flow : Simplex, Half Duplex, Full Duplex 1.7 Computer Network and its Categories 1.8 Protocol and its Elements 1.9 Concept of Standard In Networking 1.10 Standard Organizations in	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		field of Networking	
Unit-II **Network Models**	2a. Explain the concept of layered task. 2b. OSI model and its layers and explain their responsibility. 2c. Communication between layers of OSI model. 2d. Describe encapsulation of data in OSI model. 2e. Differentiate between the working of Data link layer, Network layer and Transport layer.	2.1 Concept of Layered task 2.2 Introduction to OSI Model and its layers 2.3 Layered Architecture of OSI Model 2.4 Communication and Interfaces 2.5 Encapsulation of Data 2.6 Description of Layers in the OSI Model	08
Unit III: **TCP/IP Model, Addressing in TCP/IP – IPv4**	3a. Explain the structure of TCP/IP protocol 3b. Explain in short the functions of every layer of TCP/IP 3c. Explain the function of every protocol of the IP layer 3d. Explain the concept of IP addresses in detail 3e. State need of sub-netting 3f. Define NAT. State its need 3g. Explain the header of IPv4 Packet.	3.1 TCP/IP Model 3.2 Addressing In TCP/IP 3.3 IPv4 • IP addresses • Address Space • Notations used to express IP address • Class full Addressing • Sub-netting • CIDR • NAT • IPv4 Header	12
Unit-IV **Network Topologies**	4a. Define: Network 4b. Differentiate between LAN, MAN, WAN 4c. State advantages of installing a network 4d. State disadvantages of installing a network 4e. Define network topology. 4f. State the types of network topologies 4g. Describe different network topologies	4.1 An Overview of network 4.2 Types of network • Local Area Network • Wide Area Network, MAN 4.3 Comparing types of network coverage 4.4 An Illustrated Example of a College University Network 4.5 Topologies: • The Technical • Connotation of Topology • Basic Types of Topology? • Classification of Topology	08
Unit-V **Introduction to Routing**	5a. Explain concept of routing 5b. Explain concept of switching 5c. Discuss design goals of routing algorithms 5d. Explain routing algorithms 5e. Explain Routing metrics	5.1 Routing 5.2 Path Determination 5.3 Switching 5.4 Routing algorithms • Design Goals • Routing Algorithm Types 5.5 Routing Metrics	08
Unit-VI **Switching Methods**	6a. Define Circuit Switching 6b. Explain working of a switching Node 6c. Explain concept of Time Division Switching	6.1 Switching Methods • Circuit Switching • Time Division Switching • Packet Switching	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-VII **IP Version 6 (IPv6) Configurations and Transitions**	7a. Explain IPv6 auto configuration 7b. Explain DHCP using IPv6	7.1 An Overview 7.2 Address Auto configuration 7.3 Types of Auto configuration 7.4 Auto Configuration Process 7.5 IPv6 Transition Technologies 7.6 IPv6 - Auto Configuration vs DHCPv6 7.7 DHCPv6 7.8 Summary of Benefits of IPv6 in a nutshell	12
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Networking fundamentals	04	04	--	08
II	Network Models	06	04	02	12
III	TCP/IP Model, Addressing in TCP/IP – IPv4	06	06	04	16
IV	Network Topologies	04	04	--	08
V	Introduction to Routing	06	06	04	16
VI	Switching Methods	04	04	--	08
VII	IP Version 6 (IPv6) Configurations and Transitions	06	06	--	12
TOTAL		36	34	10	80

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Observe Components of Network in your Computer Network Lab. (To know your Network Lab.)	02
2	I	Observe and describe network features	02
3	II	Connect and explain different Transmission Media and Network Control devices.	04
4	II	Prepare a Straight Cable and Network Cross over Cable and test by Line Tester.	04
5		Install a network interface card	02

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
6	IV	Connect Computers in Star Topology using Wired Media and any Network control Device	04
7	VI	Connect two hubs/switch by creating crossover connection	04
8	IV	Configure Peer-to-Peer Network	04
9		Share Printer and Folder in Network	02
10	III and VII	Install TCP/IP Protocols (Version 4 and version 6) and configure advanced features of TCP/IP Protocols	04
TOTAL			**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Find from internet list of manufacturers who develop networking components
2. Find from local market cost of networking components
3. Find specifications of networking components

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Internet videos
2. Visit to a large network installation center / site.
3. Power point presentation

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Data communications and Networking	B. A. Forouzan	McGraw Hill, Fourth Edition
2	Data communications and Networks	Achyut Godbole	Tata McGraw Hill, India Latest edition
3	TCP/IP	Dr. Sidnie Feit	Second Edition, TMH
4	Data and Computer Communications	W. Stallings	Eighth Edition, Pearson Education.
5	Michal Miller	Data and Network Communication	Thomson Delmar Learning

B) Software/Learning Websites

1. www.nptel.ac.in
2. www.tutorialspoint.com/data_communication_computer_network/ freevideolectures.com › Networking › IIT Kharagpur

C) Major Equipments/ Instruments with Broad Specifications

1. Windows PC
2. Router
3. Switch

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		M	M		M					
CO2	H		M	M		M					
CO3	M		H	H	M						
CO4	H		M	M		M					
CO5	M		H	H		H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and telecommunication Engineering (EL)
COURSE : Advanced Microcontrollers (AMC) **COURSE CODE :** 6556

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

This course deals with design programming and troubleshooting of microcontroller systems using advanced microcontrollers like PIC microcontrollers using which students will be able to design, implement and troubleshoot microcontroller based systems for different applications.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Interface peripherals to PIC microcontroller.
2. Develop logic for assembly language programming.
3. Understand the principles of working of present day microcontroller systems in various fields.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Design a microcontroller based system using PIC microcontroller.
2. Write an assembly language program for different tasks.
3. Select suitable version of PIC microcontroller for given application.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Architecture of PIC Microcontrollers**	1a. Compare CISC and RISC architecture. 1b. List RISC features of PIC microcontrollers. 1c. Draw pin diagram of PIC18F. 1d. Describe program memory organization of PIC18F458. 1e. Describe data memory organization of PIC18F458. 1f. Explain bank switching in PIC μC.	1.1 Architectural features of PIC microcontrollers 1.2 Feature of PIC 18f series microcontrollers 1.3 Pin diagram 1.4 Architecture : W Register, status register, special function registers 1.5 PIC μC file register 1.6 PIC μC data format & directives 1.7 Bank Switching in PIC μC	08
Unit-II **PIC : Instruction Set and Assembly Language Programming**	2a. Explain addressing modes of PIC18Fxx 2b. Describe different instructions of PIC18F458 2c. Write simple assembly language programs for PIC18FXX	2.1 Instruction size of PIC μC 2.2 Addressing Modes 2.3 Instruction set: Data transfer instructions, Arithmetic instructions, logical instructions, Control instruction using branch & Call, Bit oriented	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		instructions, Table processing instruction 2.4 Simple programs	
Unit III: **PIC : I/O and Timer / Counter Programming**	3a. Write an assembly language program to generate time delay. 3b. State instructions for I/O port handling 3c. Write a program for I/O bit manipulation. 3d. Write a program for timer / counter programming.	3.1 I/O port Programming 3.2 I/O bit manipulation Programming 3.3 Timer Programming : Timer0, Timer1, Timer3 Timer4 3.4 Counter Programming	12
Unit-IV **PIC : Serial Port and CCP, ECCP Programming**	4a. List major interrupts of PIC18. 4b. Program PIC18 timers using interrupts. 4c. Write a program for serial communication using interrupts. 4d. Explain, compare and capture feature of CCP and ECCP module. 4e. Write a program for compare and capture features. 4f. Explain PWM in CCP and ECCP mode. 4g. Describe different network topologies.	4.1 Interrupt Programming 4.2 Serial Port Programming 4.3 Stand & enhanced CCP module 4.4 Compare mode 4.5 Capture mode 4.6 ECCP mode Programming	12
Unit-V **PIC : External Interfaces I**	5a. Draw interfacing circuit and write assembly language program for ▪ ADC interfacing ▪ DAC interfacing ▪ LCD interfacing ▪ Keyboard interfacing ▪ RTC interfacing.	5.1 A to D converter interfacing. 5.2 D to A converter interfacing. 5.3 LCD interfacing 5.4 Keyboard interfacing 5.5 DS 1306 RTC interfacing	10
Unit-VI **PIC : External Interfaces II**	6a. Draw interfacing circuit and write assembly language program for ▪ DC motor interfacing ▪ Stepper Motor interfacing ▪ Relay interfacing.	6.1 DC motor interfacing 6.2 Stepper motor interfacing 6.3 Relay interfacing 6.4 DC motor with CCP	10
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Architecture of PIC Microcontrollers	04	04	04	12
II	Instruction Set & assembly Language Programming	04	02	08	14
III	I/O & Timer / counter Programming	06	04	04	14
IV	Serial Port & CCP, ECCP Programming	04	02	08	14
V	External Interfaces I	02	04	08	14
VI	External interfaces II	04	04	04	12
	TOTAL	**24**	**20**	**36**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	II	To observe and get acquainted with advanced microcontroller laboratory	02
2	II	To write and execute assembly/C language program for Addition & subtraction of 8 bit numbers	02
3	II	To write and execute assembly/C language program for Addition & Subtraction of 16 bit numbers	02
4	II	To write and execute assembly, C language program for Addition of 2 digit & 4 digit BCD numbers	02
5	II	To write and execute assembly/C language program for Multiplication of 8 bit number	02
6	II	To write and execute assembly/C language program for Block transfer in forward & reverse direction	02
7	II	To write and execute assembly/C language program for Block exchange	02
8	II	To write and execute assembly/C language program for Addition of hexadecimal number in an array	02
9	II	To write and execute assembly/C language program for Addition of BCD number in an array	02
10	II	To write and execute assembly/C language program to Find smallest number in an array	02
11	II	To write and execute assembly/C language program to Find largest number in an array	02
12	II	To write and execute assembly/C language program to Find positive & negative numbers in an array	02
13	V	To write and execute assembly/C language program for DAC interfacing.	02
14	VI	To write and execute assembly/C language program for DC motor interfacing.	02
15	VI	To write and execute assembly/C language program for stepper motor interfacing.	02
16	VI	To write and execute assembly/C language program for interfacing DC motor with CCP	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Find from internet list of manufacturers who develop PIC microcontroller dev. boards, cost of boards and their specifications
2. Collect list of projects, which can be done by using PIC microcontroller

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Internet videos
2. Visit to a microcontroller dev. Board manufacturing industry
3. Power point presentation

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	PIC Microcontroller & embedded systems	Muhammad Ali Mazidi	Pearson Education 3rd edition
2	Programming PIC Microcontrollers	Peatmann	Tata McGraw Hill, India Latest edition

B) Software/Learning Websites

1. www.nptel.com
2. www.datasheet.com
3. www.pic.com

C) Major Equipments/ Instruments with Broad Specifications

1. PIC microcontroller development boards
2. Interfacing circuits
3. SMPS

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		H	H	M	M					
CO2	H	H	H	H	H	M					
CO3	H	M	H	H	M	M					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Process Control and SCADA System (PCS) **COURSE CODE :** 6557

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

This course is newly introduced in the curriculum as per feedback from industries. This course covers controllers, process characteristics and applications of different control actions in process control. This course consists of fundamental aspects of process control & SCADA.

In present global scenario of manufacturing, industries are moving towards more and more automation. Various industries require DAS & SCADA technology; hence it is necessary for electronics engineers to have knowledge of process control & SCADA. This course provides basic functional knowledge of these technologies to develop operational competency.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know about process control systems in industry.
2. Understand operation of different types of control modes and advance control actions
3. Understand operation of different controllers
4. Understand operations of SCADA
5. Know the operation of RTU and MTU

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify and describe different process control systems used in industry
2. Explain different control modes and advance control actions
3. Design different electronic controllers using op-amp
4. Identify and explain different elements of DAS, data logger and SCADA
5. State functionality of various elements of SCADA
6. Interpret the functionality of RTU and MTU

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to Process Control**	1a. Define process control 1b. Explain concept of process control 1c. Classify different types of process control 1d. Identify process control elements 1e. List advantages of process control	1.1 Concept of process control 1.2 Block diagram of process control system, 1.3 Types of process control • Continuous Process Control • Discrete-state Process Control • Composite Process Control 1.4 Identification of process control elements 1.5 Advantages of process control	08
Unit-II **Control**	2a. State output equations of PI, PD and PID 2b. Explain operation of	2.1 Control modes • Discontinuous modes: ON OFF controllers: equation, neutral	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Modes	Discontinuous mode control action 2c. Explain operation of continuous mode control action 2d. Explain operation of Composite modes control action 2e. Compare different types control modes	zone • Continuous modes: PROPORTIONAL, INTEGRAL and DERIVATIVE controllers; o/p equations, corresponding Laplace Transforms and their Response, comparison • Composite modes: PI, PD and PID controllers- O/P Equations, their Response and Comparison	
Unit-III **Controllers and Advance Control Actions**	3a. Design and draw different types of Electronic controllers 3b. Explain the operation of advance control action 3c. Compare advance control actions	3.1 Electronic controllers • Two position controller, P, PI, PD and PID using op-amp 3.2 Pneumatic controllers • Two position controller, P, PI, PD, PID using nozzle-flapper 3.3 Advance control Actions Block/schematic diagrams, operation and Examples of • Feed forward control-comparison with feedback control • Cascade control • Ratio control • Selective control • Adaptive control • Split range control 3.4 Comparison of above control action	12
Unit-IV **Introduction to SCADA**	4a. Define DAS 4b. Classification of different types of DAS 4c. Draw block diagram of single channel and multichannel DAS 4d. Explain data logger 4e. Define SCADA 4f. Draw and explain Block diagram of SCADA 4g. List out Advantages, limitations and Applications of SCADA	4.1 Data acquisition system (DAS): Block diagram and operation of • Single channel DAS • Multichannel DAS 4.2 Data logger: Block diagram and operation 4.3 Definition of SCADA 4.4 Block diagram and operation of SCADA 4.5 Major elements of SCADA 4.6 Application area of SCADA 4.7 Advantages and limitations of SCADA	10
Unit-V **Real Time Systems and SCADA Software**	5a. Definition of real time control 5b. Explain Communication Access and Master-Slave concept 5c. Describe SCADA software components 5d. Explain FBD technique 5e. Compare centralized and distributed processing	5.1 Definition and Introduction of real time control 5.2 Real time control for Continuous process 5.3 Communication Access and Master-Slave concept 5.4 Determination of Scan Interval 5.5 SCADA software components 5.6 Concept of FBD technique 5.7 Comparison of centralized and distributed processing	10
Unit-VI	6a. State the components of RTU	6.1 Remote Terminal Unit (RTU) • Structure of RTU	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
SCADA Hardware	6b. Draw structure of RTU 6c. Explain test and maintenance procedures of RTU 6d. List out requirement of RTU 6e. State the functions of MTU 6f. State components of MTU	• CPU • Analog I/O • Pulse I/P • Digital I/Os • Communication Interface • Power supply • RTU Rack and Enclosure • Test and maintenance of RTU • Requirements for RTU system 6.2 Master Terminal Unit(MTU) • Hardware structure • Functions of MTU • Configuration of MTU • Redundant MTU system	
		TOTAL	**64**

5.0 SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction to Process Control	06	04	02	12
II	Control Modes	04	04	06	14
III	Controllers and Advance Control Actions	04	04	08	16
IV	Introduction to SCADA	06	04	02	12
V	Real Time Systems and SCADA Software	02	04	06	12
VI	SCADA Hardware	04	04	06	14
TOTAL		**26**	**24**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Identify the elements of Process Control System	02
2	II, III	Test and verify the operation of ON-OFF control action using op-amp	02
3	II, III	Test and verify the operation of proportional control action using op-amp	02
4	II, III	Test and verify the operation of proportional-integral control action using op-amp	04
5	II, III	Test and verify the operation of proportional-derivative control action using	04

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
		op-amp	
6	II.III	Test and verify the operation of proportional-integral-derivative control action using op-amp	04
7	III	Test and verify the operation of Pneumatic controllers (any one control action)	02
8	III	Test and verify the working of cascade control/feedback control	02
9	IV	Testing of I/O devices with SCADA system	02
10	IV, V	Develop ladder logic and graphics for SCADA applications for boiler control	02
11	IV, V	Develop ladder logic and graphics for SCADA applications packing Systems	02
12	IV, V	Develop ladder logic and graphics for SCADA applications materials handling system	02
13	IV, V, VI	Interfacing SCADA with ladder logic	02
TOTAL			**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare laboratory journal based on practicals performed.
2. Collect the data related to controlling parameters for different process control system and how they affect the performance of plant.
3. Collect the information regarding different controllers used in industries
4. Analyze the specifications for various types of DCS and SCADA.
5. Make the list of automation systems implemented in the nearby industries. Also collect the information related to manufacture and their specifications

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Arrange visits to industries based on automation systems.
2. Arrange expert lecture from industry person OR academician on topics: automation, DCS and SCADA
3. Show videos /power point presentations on different control actions and process control systems.
4. Assign mini projects to group of students

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Process Control Instrumentation Technology	C. D. Johnson	Prentice Hall of India
2	Computer Based Industrial Control	Krishna Kant	Prentice Hall of India
3	Mechatronics	M. D. Singh, J. G. Joshi	PHI Learning Pvt. Ltd.
4	Process Control	Bela Liptak	Chilton Book Company
5	SCADA: supervisory control and data acquisition	Stuart A. Boyer	ISA Publication II Edition
6	Practical SCADA for Industry	David Bailey, Edwin Wright	Newnes, (an imprint of Elsevier), 2003

B) Software/Learning Websites

1. www.controleng.com
2. www.electrical4u.com/types-of-controllers-proportional-integral-derivati...
3. www.scada.com/

4. www.controlsystemworks.com/
5. www.automationworld.com/scada/web-based-scada
6. docs.cs-cart.com/4.2.x/core/controllers/index.html
7. http://aboutinstrumentation.blogspot.co.uk/2010/12/dcs.html
8. http://www.instrumentationengineers.org/2012/02/plc-dcs-scada-hmi-for-beginners.html

C) Major Equipments/ Instruments with Broad Specifications

1 DC Regulated dual Power supply.

1. O/P voltage – 0 to 30 Volt, 2A in 3 range in both channel
2. Display – 3 ½ digit
3. Load regulation – 0.5 V % + 10 mV, no load full load for each channel
4. Line regulation – 0.05 % + 15 mV for +/-, Variation around 230 volt
5. O/P imp – 15 milliohms
6. Ripple – less than 1mV rms
7. I/P supply – 230 V +/- 10 % 50 Hz
8. Both channel tracking mode

2 Function generator 3MHz.

1. Out Put wave form – Sine, Triangle, Square.
2. Frequency range – 0.1 Hz to 3 MHz.
3. Amplitude Range – 30 mV to 30 V P-P.
4. O/P impedance – 50 V.
5. Offset capability.
6. Display – 4 digit LED/ LCD

3 Pulse Generator.

1. Pulse repetition rate – 0.1 Hz to 10 MHz in 8 decade ranges.
2. Rise and fall time – 10 ns - 2 ns
3. Pulse width – 35 ns and 0.1 µsec to 1 sec in y decade range.
4. O/P – 40 mV to 5 V across 50 Ω in six step.
5. Power supply – 230 V +/- 10, 50 Hz.

4 CRO

1. Dual Channel, 4 Trace CRT / TFT based.
2. Bandwidth 20 MHz/30 MHz.
3. X10 magnification 20 nS max sweep rate.
4. Alternate triggering.
5. Component tester.
6. Digital Read out.
7. USB interface.
8. Any other Oscilloscope with additional features are also suitable.

5 Demonstration models/kits

1. DAS TRAINER
2. PLC trainer

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	M	H	H	M						
CO2	H	M	H	H	M						
CO3		M	H	H	M						
CO4	H	M	H	H	M						
CO5	H	M	M	M	M						
CO6	H		H	H	M	M					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Mobile Communication (MCM) **COURSE CODE :** 6558

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

The glorious 21st century marks the mobile radio communication industry by orders of magnitude. The recent exponential growth in cellular mobile communication needs more skilled technicians for operation, maintenance & servicing of mobile cellular system. This course is classified under technology group and it is based on communication theory, which gives theoretical as well as practical knowledge of different cellular system. It covers digital cellular mobile system such as GSM, IS – 95 standards, WLL, call processing & basic of mobile communication system

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand operation of different mobile communication system.
2. Describe cellular concept such as frequency reuse, hand off available in various mobile standards.
3. Understand GSM system, CDMA (IS-95), SS7 architecture and call processing in these systems.
4. Understand 3G, 4G, 4.5G mobile communication system.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Analyze the different sections of mobile unit.
2. Locate the faults in mobile unit.
3. Understand different hand-off strategies.
4. Analyze various mobile systems.
5. Explain different wireless technologies.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Wireless Communication System**	1a. Need of mobile communication system. 1b. State basic features of AMPS, N AMPS, IS-95, GSM standards. 1c. Define terms used in mobile communication system. 1d. Explain principle of Working of cordless telephone system, cellular telephone system and call processing	1.1 Evolution of mobile radio communications : 2G, 2.5G and 3G wireless system 1.2 Mobile radio system around the world: AMPS, IS 95, GSM N-AMPS Definitions: Base station, Mobile station, Mobile switching center, Control Channel, Forward Channel and Reverse channel 1.3 Cordless telephone system. 1.4 Cellular telephone system, Call processing in cellular	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		telephone system.	
Unit-II **Mobile Unit**	2a. Identify different blocks in mobile unit. 2b. Draw block diagram and explain operation of mobile Unit, frequency synthesizer, transmitter, receiver, Logic and Control unit.	2.1 Mobile Unit: Block diagram and operation of mobile Unit. 2.2 Block Diagram and operation of frequency synthesizer, 2.3 Block Diagram and operation of transmitter, Receiver, Logic Unit and Control unit.	06
Unit-III **Digital Cellular Mobile Systems**	3a. Draw and explain architecture of basic cellular system. 3b. Enlist different features and specifications of basic cellular system. 3c. Names different multiple Access Technologies for Cellular systems. 3d. Explain Frequency reuse. 3e. Describe Co channel interference and adjacent channel interference. 3f. State the concept of sectoring. 3g. Uses of repeater in cellular system. 3h. Define micro cell.	3.1 Basic Cellular system. 3.2 Frequency reuse concept 3.3 Multiple Access Technologies for Cellular systems. 3.4 Hand off strategies: Hard Hand- OFF, Soft Hand Off, Delayed Hand -OFF, Queued Hand-Off. 3.5 Interference and system capacity: Co channel interference and adjacent channel Interference 3.6 Improving coverage of cellular system: Cell splitting, Sectoring and Repeater for range extension. 3.7 Micro-cell zone concept.	16
Unit-IV **Digital Cellular Mobile System (GSM)**	4a. State the special features of GSM. 4b. Draw and explain the system architecture of GSM. 4c. State the services perform by GSM. 4d. Describe the security in GSM. 4e. Explain call processing in GSM.	4.1 G.S.M.: Concept of GSM, service and features. 4.2 GSM Architecture. 4.3 GSM Radio subsystem. 4.4 Security Aspects. 4.5 Typical flow sequence in GSM	08
Unit-V **CDMA Digital Cellular Mobile System**	5a. State performance services of SS-7 and explain its protocol architecture 5b. State features of IS-95 CDMA system. 5c. List the frequency and channel specifications of IS-95. 5d. Draw system architecture of IS-95.	5.1 Signal system no. 7 (SS7) - protocol architecture, performance services. 5.2 CDMA digital cellular standard IS-95, IS-95 frequency and channel specification, IS-95 system architecture, IS-95 CDMA calls processing. 5.3 Features of IS-95.	12
Unit-VI **Modern wireless Networks**	6a. State the popular 3G wireless system. 6b. Explain the concept of UMTS. 6c. List the vision of IMT 2000. 6d. State the features and	6.1 3G W-CDMA (UMTS) (Universal mobile Telecommunication system): Introduction, Features, Protocol Layers, Features of W-CDMA. 6.2 Wireless local loop: Necessity	14

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	specifications of IMT 2000. 6e. Explain the nature and feature of 3GW-CDMA. 6f. Draw and explain the operation of LMDS. 6g. Explain the concept of Ad-voc network. 6h. Draw and explain architecture of 4G and MANET.	of wireless equipment, Concept, Features, Operation, advantages and applications. 6.3 LMDS (local multipoint distribution system): Introduction, operation and demerits. 6.4 IMT 2000: Introduction, objectives, features, specifications and architecture. 6.5 Concept of Ad-Voc mobile communication for 4G and 4.5G. 6.6 4G wireless architecture and MANET.	
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	**U Level**	**A Level**	**Total Marks**
I	Wireless Communication System	06	02	--	08
II	Mobile Unit	04	06	--	10
III	Digital Cellular Mobile Systems	04	08	--	12
IV	Digital Cellular Mobile System (GSM)	04	10	--	14
V	CDMA Digital Cellular Mobile System	06	10	--	16
VI	Modern Wireless Networks	06	10	04	20
	TOTAL	**30**	**46**	**04**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Perform installation of mobile phone, registration, activation and authentication of mobile handset.	02
2	II	Observe Input / Output signal of different sections of mobile phone unit.	02

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
3	II	Read the content of SIM card	02
4	II	Perform testing procedure of different sections of mobile phone	02
5	III	Find out different add-on accessories for cell phones such as battery, charger, hands free data cable, memory card and their interfacing with Handset.	04
6	III	Identify different sections and component of mobile unit such as Ringer section, dialer section, receiver section etc.	02
7	III	Troubleshooting and testing of mobile handset. Such as Speaker problem, Ringer problem, Mike problem, Vibrator problem, SIM card problem, charging problem, display problem, Dialing/keypad problem, Dead handset, Network problem, water dipped handset	04
8	IV	Check network availability manual and auto selection of network using AT commands in mobile.	04
9	IV	Observe the process of Call connection and Call release of mobile system	04
10	IV	Visit to Telephone exchange office/ Mobile tower.	06
TOTAL			**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Industrial visit to BTS site or MSC.
2. Workshop on mobile repair by service technician of any mobile repairing centre.
3. Explore websites to understand repairing of various mobile handsets.
4. Download different specifications of basic cellular system.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video to demonstrate the working principles, constructional features, testing and understandings of different types of modulations.
2. Arrange a visit to any Radio station.
3. Arrange expert lecture of an industry person in the area of communication.
4. Arrange faulty electronic circuit and provide to students for repairing.(Case Study)
5. Encourage students to build communication circuits.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Wireless communication principle and Practice	Rapport T.S.	PHI Learning, New Delhi, (Latest Edition)
2	Mobile and Personal Communication System and Servicing	Pandya Raj	IEEE
3	Mobile Communication	Lee C. Y.	Pearson, New Delhi (Latest Edition)
4	Mobile Cellular Telecommunication System	Lee C. Y.	TMH, New Delhi, (Latest Edition)
5	Wireless communication	Dalal Upena	OXFORD, New Delhi
6	Advance Mobile Repairing	Pandit Sanjib	BPB, (Latest Edition)
7	Mobile Communication	Schiller	PHI Learning, New Delhi, (Latest Edition)

B) Software/Learning Websites

1. www.learnerstv.com
2. http://www.nptl.com
3. www.academia.edu

C) Major Equipments/ Instruments with Broad Specifications

a.	Oscilloscope / storage oscilloscope	Dual channel 100 MHz
b.	Spectrum analyzer	Up to 2-3 GHz capture bandwidth
c.	GSM Trainer	GSM wireless standards
d.	CDMA Trainer	CDMA standards
e.	Mobile Handset Trainer	GSM based handset trainer with fault creation and test points
f.	Modulation technique Trainer board	On board Modulation/Demodulation (GMSK) for mobile system
g.	PN sequence generator training board	Generate different PN Data

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		M	M	H	H					
CO2	H		M	M	H	H					
CO3	H					M					
CO4	H		M	M	H	H					
CO5	H		L	L	H	H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Embedded System (EMS) **COURSE CODE :** 6559

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

To understand the facts, concepts, principles and procedures of Embedded System Design

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Compare the advanced microcontrollers.
2. Describe function of embedded systems hardware units like processor, I/O devices, On-chip and Off-chip device, power supply etc.
3. Interface various devices using ports.
4. Perform software analysis, design, implementation, testing, debugging for embedded system.

3.0 COURSE OUTCOMES:

The course should be taught and practical should be carried out in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

1. Compare and select appropriate processor or microcontroller for specific embedded application.
2. Select the appropriate hardware configuration for the particular embedded application
3. Realize the concept of embedded system and Design the embedded system.
4. Design software for specific embedded application in embedded C language.
5. Test and troubleshoot the hardware, software using different testing and debugging tools.
6. Realize the basic concept of real time operating system and their uses in embedded system.
7. Perform software analysis, design, implementation, testing, debugging for embedded systems.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Basics of Embedded System**	1a. Define embedded system and categories it 1b. Explain recent trends in embedded system and its specialties 1c. Draw hardware, software architecture of embedded system and explain it.	1.1 Embedded system: Definition, Categories, Overview, Specialties and Recent trends. 1.2 Hardware architecture: CPU, Memory, Clock, timer, I/Os, USART. 1.3 Software Architecture: OS services, Architecture, categories, software application, communication software.	10
Unit-II **Communication Protocols**	2a. Explain Serial, parallel, wireless protocols 2b. Draw and explain serial communication registers	2.1 Introduction to communication protocol 2.2 Introduction to RS232, pin out 2.3 Serial protocol: I^2C, CAN,	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	of 8051. 2c. Describe RS232.	Firewire, USB. 2.4 Parallel Protocol: PCI, ARM7 TDMI bus. 2.5 Wireless Protocol: Bluetooth, IEEE802.11, IRDA.	
Unit-III **Embedded C**	3a. State the concept of Device Driver and explain its types. 3b. State software development tools and draw software development cycle. 3c. Design and interface different interfacing units to 8051 and develop program using embedded C.	3.1 Concept of Device Drivers, types 3.2 Software development tools. 3.3 8051 programming using embedded C: ADC, DAC, Stepper motor, LCD, Seven segment Display, 3.4 Embedded Application: Digital Camera	12
Unit-IV **Operating systems Concepts And RTOS**	4a. State the different components of operating system. 4b. Draw architecture of RTOS and explain it. 4c. Explain scheduling algorithms of operating system.	4.1 Components of OS: Tasks, Task states, task and data, semaphore and shared data, message Queues, mail boxes, pipes, events, Concept of Starvation, Deadlock, Multitasking. 4.2 Scheduling Algorithms. 4.3 Introduction to RTOS: Concept of RTOS, RTOS Architecture, Requirement, Need, Specification of RTOS in Embedded systems. 4.4 RTOS Application: Underground Tank Monitoring system.	12
Unit-V **ARM 7 Architecture**	5a. Draw architecture, block diagram, functional diagram of ARM 7TDMI and explain it. 5b. Explain programmer's model and operating modes of ARM7. 5c. State the different group of instructions of ARM 7.	5.1 Architecture: Introduction ARM7TDMI core, Block diagram, functional diagram. 5.2 Programmers model. 5.3 Various operating modes of ARM7. 5.4 Instruction set: Data processing instructions, Arithmetic and Logical instruction, Branching, Load and Store.	14
Unit-VI **Interfacing and programming with ARM 7**	6a. Write assembly language programs for ARM7 6b. Design Embedded C language programs for LED and relay.	6.1 Assembly programming of ARM7 16/32 bit addition, 16/32-bit subtraction, 32 bit- Multiplication. Find 1's complement. 6.2 Programming and interfacing of LEDs, Relay with ARM (embedded C).	06
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Basics of Embedded System	06	08	--	14
II	Communication Protocols	02	10	--	12
III	Embedded C	04	04	08	16
IV	Operating systems Concepts And RTOS	04	12	--	16
V	ARM 7 Architecture	04	06	04	14
VI	Interfacing and programming with ARM 7	--	04	04	08
TOTAL		**20**	**44**	**16**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	III	Development of embedded C language program to find largest and smallest number from the array using Keil.	02
2	III	Development and execution of the programme to Display digits (0 to 9) on seven segment display using 8051	02
3	III	Development and execution of the programme to rotate stepper motor in forward and reverse direction using 8051.	04
4	III	Development and execution of the programme to Display" GP NASHIK "message on LCD (16 X 2) using 8051.	02
5	III	Develop and execute an embedded c program to generate Square Wave at DAC output using 8051.	02
6	IV	Case study on Real time embedded application Underground Tank Monitoring system.	02
7	VI	Develop and execute Assembly language program of 16/32 bit addition for ARM7.	04
8	VI	Develop and execute Assembly language program of 16/32 bit subtraction for ARM7.	04
9	VI	Develop and execute Assembly language program of 32 bit Multiplication for ARM7.	04
10	VI	Develop and execute Assembly language program to find 1's complement of a number for ARM7.	02
11	VI	Interface 8 LED to ARM7TDMI and develop embedded C language program to blink the LED's.	02
12	VI	Interface Relay with ARM7 and develop program in embedded C language.	02
TOTAL			**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare journals based on practical performed in embedded system design laboratory.
2. Prepare chart showing all instructions of ARM7.
3. Case Study based on embedded applications.
4. Develop mini projects.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Lecture method.
2. Show video/animation film to demonstrate the software and hardware design in embedded system.
3. Arrange a visit to any embedded system industry.
4. Arrange expert lecture of any industry person or any Academics person in the area of RTOS, ARM and Embedded design.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication with Year
1	Embedded System Design	Frank Vahid	John Willy 2002
2	Programming embedded system in C and C++	Michal Barr	Oreilly 1999, ISBN=1565923545
3	The 8051 microcontroller and Embedded System	Muhammad Ali Mazidi	Pearson 2008, Second Edition ISBN 978-81-317-1026-5
4	Embedded Real Time System Concepts, design and Programming	V. K. Prasad	Dreamtech 2013 ISBN 978-81-7722-461-0
5	Embedded Real Time Systems Programming	Sriram V. Iyer, Gupta	Tata McGraw Hill, Education 2003 ISBN-9780071331128
6	Embedded System	Raj Kamal	Tata McGraw Hill, Education 2012 ISBN-10-0-07-066764-0
7	An Embedded Software Primer	David Simon	Pearson 2003 ISBN=8177581546
8	Embedded System Design	Steve Heath	Elsevier, 2002 second edition ISBN-0750655461
9	ARM System Developer's Guide	Sloss	Esleiver 2004 ISBN-1558608745
10	Arm System-On-Chip Architecture	Steve Furber	Pearson 2009 ISBN-978831708408
11	ARM Architecture Reference Manual	Jaggar, Dave	Prentice Hall. 1996 pp. 6– ISBN 978-0-13-736299-8

B) Software/Learning Websites

1. www.arm.com
2. www.Keil.com
3. www.infocenter.arm.com
4. www.embedded.com.

C) Major Equipments/ Instruments with Broad Specifications

Sr. No.	Name of Equipments/ Instruments	Broad Specifications
1	8051 development board	Having on board interfacing of all basic peripherals.
2	ARM 7 development board	Having on board interfacing of all basic peripherals.
3	Keil Simulator (Web version)	

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H										
CO2	H										
CO3			H	M							
CO4						H					
CO5	L	H			L						
CO6	H					L					
CO7	L	M				H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Mechatronics: Components and Systems (MCS) **COURSE CODE :** 6560

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

This course is newly introduced in a curriculum as per feedback from industries. This course deals with computer integrated electro mechanical systems such as NC, CNC, DNC, MEMS and ROBOTS. Students will be able to select sensors, actuators and to develop advanced functionalities for the design of electro-mechanical systems.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know the elements of Mechatronics systems.
2. Understand the significance of sensors used in Mechatronics.
3. Understand the different types of actuators used in Mechatronics.
4. Understand the working principle of CNC machines
5. Understand the fundamentals of Robotics and micro electro-mechanical systems

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify different Mechatronic systems and their elements.
2. Interpret functionality of different sensors and actuators.
3. Identify different parts and components of robot.
4. Explain working of CNC machine
5. Describe working of micro sensor and micro actuator of MEMS

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Elements of Mechatronic System**	1a. State importance of Mechatronics 1b. Draw block diagram of Mechatronic system 1c. Explain elements of Mechatronics system 1d. List advantages and disadvantages of Mechatronic.	1.1 Importance of Mechatronics in various fields of engineering 1.2 Evolution of Mechatronics 1.3 Block diagram of Mechatronic systems and identification of elements (Sensors, signal conditioners, controllers and Actuators) 1.4 Advantages and disadvantages of Mechatronics systems 1.5 Applications of Mechatronics	08
Unit II **Sensors in Mechatronics Systems**	2a. Compare transducer and sensors 2b. Classify different types of sensors 2c. Explain operating principle	2.1 Comparison between transducers and sensors 2.2 Proximity and position Sensors: construction, principle of operation and applications	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	of Proximity and position Sensors 2d. Explain operating principle of Electromagnetic transducers 2e. Explain operating principle of Motion Sensors 2f. Explain operating principle of acceleration sensors 2g. Explain operating principle of torque sensors	• Photo electric sensors • Hall effect sensors • eddy current proximity sensors 2.3 Velocity Sensors: construction, principle of operation and applications • Electromagnetic transducers 2.4 Motion Sensors: construction, principle of operation and applications • Stroboscope • Pyroelectric Sensors 2.4 Acceleration sensors: construction, principle of operation and applications • Strain gauge accelerometer • Piezo-electric accelerometer • LVDT accelerometer 2.5 Torque sensors : construction, principle of operation and applications • Torque measurement using strain gauge • Torque measurement using torsion bar, optical method and capacitive method	
Unit-III **Actuators in Mechatronics Systems**	3a. Define actuators 3b. Classify different types of actuators 3c. List and explain different types of mechanical and electrical actuators.	3.1 Definition of actuators 3.2 Classification of actuators 3.3 Types actuators : Working principle and operation of- • Limit switches • proximity switches • magnetic reed switches • Solenoid valves • direction Control valves (Poppet valve, spool valve) • Relays • Cams • Gears • Belts • Rack and Pinion and Bearings • single acting and double acting cylinders • Rotary actuators (rotating vane, gear type)	12
Unit-IV **CNC Systems**	4a. Differentiate between CAM, NC, CNC and DNC 4b. Draw block diagram of CNC machines 4c. Classify CNC machines 4d. Explain different modes of CNC machine 4e. List out selection criteria of	4.1 Computer aided manufacturing(CAM) Numerical control(NC) Computer numerical control machine(CNC) and Direct numerical control DNC 4.2 Comparison between NC, CNC and DNC 4.3 Block diagram of CNC machine.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	CNC machine	4.4 Classifications of CNC Machine 4.5 Modes of operation of CNC 4.6 Selection criteria of CNC machine. 4.7 Advantages and disadvantages of CNC machines	
Unit-V **Micro Electro Mechanical Systems (MEMS)**	5a. Define MEMS 5b. Draw Block diagram of MEMS 5c. Explain MEMS micro sensor and micro actuators 5d. List Advantages and Applications of MEMS	5.1 Introduction of MEMS 5.2 Block diagram of MEMS 5.3 MEMS micro-sensor 5.4 MEMS micro-actuators 5.5 Advantages of MEMS 5.6 Applications of MEMS	10
Unit-VI **Robotics**	6a. Define robot 6b. State necessity of robotics 6c. Draw Block diagram of robot 6d. Define terms related to robotics 6e. Explain different types of robots 6f. List out selection parameters of robots 6g. List applications of robots	6.1 Definition of Robot 6.2 Necessity of robotics 6.3 Block diagram of robot 6.4 Definitions related to robotics • Work envelop • Degree of freedom • End effectors • Manipulators 6.5 Types of robots : Cartesian, Spherical and Cylindrical 6.6 Selection parameters of robot. 6.7 Applications of robots	12
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Elements of Mechatronic System	06	04	02	12
II	Sensors in Mechatronics Systems	04	06	04	14
III	Actuators in Mechatronics Systems	04	06	04	14
IV	CNC systems	04	04	06	14
V	Micro Electro-mechanical Systems (MEMS)	04	04	04	12
VI	Robotics	04	04	06	14
	TOTAL	**26**	**28**	**26**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that

common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Demonstrate any one application of Mechatronics	02
2	II	Test and verify the operation of Photo electric sensors	02
3	III	Demonstrate the operation of linear, equal percentage and quick opening control valve.	02
4	II	Measurement of speed using stroboscope	02
5	III	Measurement of torque using torsion bar	02
6	III	Demonstrate the operation of single acting and double acting cylinder	02
7	IV	Demonstration of operating modes and constructional feature of CNC operation(any one application)	02
8	III	Demonstrate the operation of Relays	02
9	III	Demonstrate the operation of Solenoid valves	02
10	III	Demonstrate the operation of Cams	02
11	III	Demonstrate the operation of Gears	02
12	III	Demonstrate the operation of Belts	02
13	VI	Configure the working of robots	02
14	VI	Use the robot end effecters	02
15	VI	Use the different types of sensor in robotics.	02
16	VI	Use robot trainer to perform different tasks	02
TOTAL			**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Collect the information of different Mechatronic systems used in day-to-day life.
2. Prepare the charts of different types of sensors and actuators.
3. Collect the specifications of CNC machines of different manufacturers.
4. Collect the information of manufacturing processes of MEMS.
5. Identify the different types of robots used in industries.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Arrange industrial visit
2. Expert lecture from industrial OR academician
3. Show videos /power point presentation from renowned experts in the area of Mechatronics, sensors used in Mechatronics, MEMS and Robotics

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Mechatronics - Integrated Mechanical electronic systems	K. P. Ramachandran, G. K. Vijayaraghavan, M. S. Balasundaram	Wiley-India
2	Mechatronics	M. D. Singh and J. G. Joshi	PHI Learning Private Limited, New Delhi
3	Mechatronics : Principles, Concepts and Applications	Nitaigour Premchand Mahalik	Tata McGraw Hill, New Delhi
4	Mechatronics	W. Bolton	Pearson
5	CNC Machines	Pabla, B.S. and Adithan M	New Age International,

Sr. No.	Title of Book	Author	Publication
			New Delhi, 2014
6	Robotics for Engineers	Koren Yoram	McGraw-Hill Education, New Delhi, 1st Edition
7	Robotics	Fu K. S., Gonzalez R C., Lee C S G	McGraw -Hill Education, New Delhi Pvt. Ltd

B) Software/Learning Websites

1. www.mems-exchange.org/
2. www.allaboutmems.com
3. http://mechatronic.me/1-what-is-mechatronics
4. http://www.cnccookbook.com/CCCNCMachine.htm
5. http://nptel.ac.in/courses/112103174/32
6. http://www.kuka-robotics.com/india/en/
7. http://www.parirobotics.com/

C) Major Equipments/ Instruments with Broad Specifications

1 DC Regulated dual Power supply.

1. O/P voltage – 0 to 30 Volt, 2A in 3 range in both channel
2. Display – 3 ½ digit,
3. Load regulation – 0.5 V % + 10mV, no load full load for each channel
4. Line regulation – 0.05 % + 15 mV for +/-, Variation around 230 volt
5. O/P imp – 15 milliohm,
6. Ripple – less than 1mV rms.
7. I/P supply – 230 V +/- 10 % 50 Hz.
8. Both channel tracking mode

2 Function generator 3MHz.

1. Out Put wave form – Sine, Triangle, Square.
2. Frequency range – 0.1 Hz to 3 MHz.
3. Amplitude Range – 30mV to 30 Volt P- P,
4. O/P impedance – 50 V.
5. Offset capability,
6. Display – 4 digit LED/ LCD

3 Pulse Generator.

1. Pulse repetition rate – 0.1 Hz to 10 MHz in 8 decade ranges.
2. Rise and fall time – 10 ns - 2 ns
3. Pulse width – 35 ns and 0.1 µsec to 1 sec in y decade range
4. O/P – 40 mV to 5 V across 50 Ω in six step,
5. Power supply – 230 V +/- 10 % 50 Hz.

4 CRO

1. Dual Channel, 4 Trace CRT / TFT based
2. Bandwidth 20 MHz/30 MHz
3. X10 magnification 20 ns max sweep rate
4. Alternate triggering
5. Component tester
6. Digital Read out
7. USB interface
8. Any other Oscilloscope with additional features are also suitable

5 Demonstration kit

1. Demonstration kit of Photo electric sensors
2. Demonstration kit of control valve
3. Stroboscope
4. Torsion bar
5. Demonstration kit of single acting and double acting cylinder
6. Demonstration model of CNC

7. Demonstration kit of Relays
8. Demonstration kit of Solenoid valves
9. Demonstration kit of Cams
10. Demonstration kit of Gears
11. Demonstration kit of Belts
12. Demonstration model of robot trainer

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		H	H	M	M					
CO2	H		H	H	M	M					
CO3	H		H	H	H	M					
CO4	H		M	M	L						
CO5	H	M	H	H	M	M					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Antenna and Microwaves (AMW) **COURSE CODE :** 6561

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

This course imparts knowledge of microwave transmission and reception, latest microwave technology and different antenna types and their applications.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand concepts and applications of microwave and optical spectrum.
2. Understand construction and working of microwave components and devices.
3. Know the antenna structure, terminology, practical antennas, microwave fundamentals and devices.
4. Identify mobile network antennas.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Select the antennas for different applications.
2. Prepare the specifications for DTH systems.
3. Explain with sketch different smart antennas.
4. List the applications of microwave devices.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Basic Electromagnetic Theory**	1a. Describe properties of electromagnetic waves. 1b. Explain the basic concepts of electromagnetic wave theory. 1c. Describe the basic radiating antennas. 1d. For the given application choose the relevant radiator	1.1 Physical concept of generation of EM Wave. 1.2 Static electric and magnetic field of steady electric current. 1.3 Electromagnetic field and its radiation from a center fed dipole. 1.4 Elementary radiator 1.5 Hertzian dipole; Half-wave dipole, Power radiated by elementary dipole using Poynting Vector method	08
Unit-II **Antenna Terminologies**	2a. Distinguish between antenna and aerial. 2b. Calculate the basic antenna parameters using standard formulae. 2c. Identify antenna specifications	2.1 Basic parameters: Aerial and antenna, Antenna Impedance, Radiation Resistance, Radiation Pattern, Beam area and beam efficiency, Isotropic radiator gain, directivity and Gain, radiation intensity, half power BW, polarization, antenna losses, antenna efficiency, effective aperture, effective length of antenna, effects of antenna height, front to back ratio, antenna field zones	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-III **Basic Antennas and Arrays.**	3a. Select antennas and antenna arrays as per their operating frequency ranges and radiation pattern for the specific applications	3.1 Radiation characteristics of wire antennas: Resonant wire antennas (λ, 2λ), Non-resonant (Rhombic) Antenna 3.2 Loop antenna 3.3 Folded dipole 3.4 Antenna Arrays: Uniform linear array, Broad side array, End fire array 3.5 Yagi-Uda antenna	16
Unit-IV **Antennas for Special applications**	4a. Classify antennas used in VHF/ UHF band 4b. Identify mobile network antennas 4c. Explain the concept of Smart Antennas and its applications 4d. Prepare the specifications for the required indoor or outdoor DTH systems	4.1 VHF/UHF antennas: Helical antenna, parabolic reflector antenna, Horn antenna, Turnstile, super turnstile antenna and Log Periodic. 4.2 Micro strip patch antenna 4.3 Terrestrial mobile communication antennas: Base station antennas, Mobile station antennas 4.4 Smart antennas: Need and applications 4.5 DTH receiver system: outdoor unit, antenna system and indoor unit	08
Unit-V **Wave Guide**	5a. Need of microwave communication system. 5b. Define TEM/TE/TM/HE, cut off frequency of a waveguide, guide wave length, phase velocity, group velocity. 5c. Draw and explain dominant mode in rectangular waveguide. 5d. Explain the propagation of wave in rectangular waveguide. 5e. Compare waveguide and two-wire transmission line.	5.1 Microwave Region and Band Designations. 5.2 Introduction to TEM/TE/TM/HE wave. 5.3 Comparison of wave guide with two wire transmission line. 5.4 Propagation of waves in rectangular wave guide only. (Introduction to wave guide only) 5.5 TE and TM Modes in rectangular wave guide with field pattern. Concept of dominant mode. 5.6 Definition and interpretation of cut off frequency of a waveguide, guide wave length, phase velocity, group velocity. (Simple Numerical)	10
Unit-VI **Microwave Components and Devices**	6a. State principle and draw construction of multi cavity (two cavities) klystron, Reflex Klystron amplifier, Travelling wave tube, Magnetron. 6b. Draw the construction and working of PIN, IMPATT, Tunnel and Gunn diode. 6c. Explain bends and corners, Twists. 6d. Draw and explain working of H- plane TEE, E-Plane TEE, E-H Plane TEE, Multi-hole directional	6.1 Construction, working Principles and Applications of: Multicavity (Two cavities) klystron amplifier, Reflex Klystron amplifier, Travelling wave tube, Magnetron. 6.2 Construction and working principle and Applications of microwave Diodes: PIN, IMPATT, Tunnel and Gunn. 6.3 Working principle of Parametric amplifier 6.4 Construction, Working principle and applications of H- plane TEE, E-Plane TEE, E-H Plane TEE, Multi-hole directional coupler, wave guide,	14

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	coupler, wave guide, circular, Isolator.	bends, corners, Twists, circular, Isolator.	
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	R Level	U Level	A Level	Total Marks
I	Basic Electromagnetic Theory	06	04	--	10
II	Antenna Terminologies	06	06	--	12
III	Basic Antennas and Arrays	04	06	02	12
IV	Antennas for Special Applications	04	08	02	14
V	Waveguide	06	08	--	14
VI	Microwave Components and Devices	06	10	02	18
TOTAL		**32**	**42**	**06**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	III	Check the radiation pattern of half wave dipole and find HPBW.	02
2	III	Check radiation pattern of loop antenna.	02
3	III	Check radiation pattern of folded dipole antenna.	02
4	III	Fabricate the demonstrative physical model of Yagi–Uda antenna with at least 3 radiator and one reflector.	02
5	III	Test the performance of the Yagi–Uda antenna.	02
6	III	Test the performance of the broad side array.	02
7	III	Test the performance of the end fire array antenna.	02
8	IV	Test the performance of helical antenna in horizontal and vertical planes.	02
9	IV	Check the radiation pattern of parabolic reflector antenna.	02
10	IV	Test the performance of horn antenna.	02
11	IV	Select the relevant Mobile Antenna System for a particular area.	02
12	IV	Install and commission DTH receiver systems.	04
13	VI	Assemble Microwave Test Bench and five major Microwave components.	02
14	IV	Visit to GMRT, Khodad.	04
TOTAL			32

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Industrial visit to BTS site or MSC.
2. Workshop on mobile repair by service technician of any mobile repairing centre.
3. Explore websites to understand repairing of various mobile handsets.
4. Download different specifications of basic cellular system.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video to demonstrate the working principles, constructional features, testing and understandings of different types of antennas and microwave devices.
2. Arrange a visit to any Radio station.
3. Arrange expert lecture of an industry person in the area of antenna and microwave communication.
4. Encourage students to learn different antennas for various applications.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Antennas and Wave Propagation	Kraus John D, Marhefka Ronald J. and Khan Ahmad S.	Tata McGraw-Hill Education, Fourth Edition, or latest
2	Antennas and Wave Propagation	Prasad, K.D. and Handa, Deepak	Satya Prakashan, New Delhi, 3rd edition or latest
3	Antennas and Wave Propagation	Raju, G. S. N.	Pearson Education India, 3rd edition or latest
4	Antenna and Wave propagation	Das, Sisir and Das K. Annapurna	Tata McGraw-Hill Education, 2013
5	Antenna and Wave propagations	Harish, A. R. And Sachidananda M.	Oxford University Press, 4th Edition or latest
6	Microwave Devices and Circuits	Liao Samuel Y.	PHI Learning, New Delhi, (Latest edition)

B) Software/Learning Websites

1. http://www.rfmw.org/transmission_lines_and_distributed_systems_transmission_lines_transmission _lines.html
2. http://www.rfmw.org/transmission_lines_and_distributed_systems_transmission_lines_transmission _lines_video_lectures.html
3. www.nptel.ac.in
4. www.cst.com
5. http://www.antennamagus.com/
6. http://www.antennamagus.com/antennas.php?page=antennas
7. http://emcos.com/Antenna-Simulation-and-Optimization
8. http://www.apparentlyapparel.com/uploads/5/3/5/6/5356442/practical_antenna_handbook_fourth_edition_carr.pdf

C) Major Equipments/ Instruments with Broad Specifications

1.	Experimental antenna trainer kit	(preferred with software simulator)
2.	Spectrum analyser	30 MHz
3.	Standard DTH receiver system.	
4.	Antenna synthesis simulation	demonstrative software
5.	Gunn / klystron power supply	'X' band
6.	VSWR meter	Resonated at 01 kHz
7.	Microwave bench(Gunn / klystron)	'X' band component
8.	Microwave accessories	BNC to BNC cables, Main Chords.
9.	Microwave components	'X' band

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		H	H	M	M					
CO2	H		H	H	M	M					
CO3	H		M	M	M	M					
CO4	H		H	H	M	M					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : VLSI Techniques (VLT) **COURSE CODE :** 6562

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

The influence of integrated-circuit technology in the past few years on our society has been pervasive, in area ranging from consumer products to business management to Manufacturing control. The driving force behind this pervasiveness is that the functional Capability of modern integrated circuitry has increased in scope and complexity exponentially with time over the past 20 years. The designers of modern integrated Circuitry have continually endeavored to provide more computational speed with less dissipated electrical power and less circuit board area, while maintaining a low failure rate and an aggressive cost. The complexity and speed is finding ready application for VLSI systems in digital processing. Although silicon MOS-based circuitry will meet most requirements in such systems. The student can acquire knowledge in the design skill of Combinational and sequential circuit with the help of VHDL and CMOS Logic circuit Processing operation, student can use this knowledge as technician, supervisor and Programmer in different sections of industry.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand structure of VHDL language
2. Write VHDL program for combinational and sequential circuits.
3. Understand internal structure of CPLD and FPGA.
4. Develop Mealey and Moore machines using k-map.
5. Understand CMOS IC fabrication process.
6. Implement circuits using CMOS technology.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Write synthesis and test VHDL program for combinational and sequential circuits.
2. Select appropriate CPLD or FPGA for an application.
3. Design a Mealy or Moore machine using k-map and VHDL.
4. Develop small CMOS circuit using equations.
5. Develop small IC circuit for an application.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Hardware Descriptive Language**	1a. Write syntax of library, entity, architecture. 1b. Know different program modelling style. 1c. Differentiate between signal and variable. 1d. Explain combinational and sequential statements.	1.1 Introduction to VLSI, VLSI design flow. 1.2 Features of VHDL –Library, Entity, types of architecture-Data flow, structural and behavioral modelling. 1.3 Different types of statements-Concurrent – When statement, With. Select statement. Generate statement. 1.4 Different types of statements-Sequential- Process, Signal assignment verses variable assignment, constant, IF, CASE, LOOP, ASSERT and WAIT statements.	08
Unit-II **Subprogram and Packages**	2a. Explain various VHDL data types. 2b. Explain Component declaration. 2c. Explain functions and procedures. 2d. Use packages for programming. 2e. Understand different attributes and their uses. 2f. Explain configuration.	2.1 VHDL Data types and operators. 2.2 Component Declaration with example. 2.3 Functions with example. 2.4 Procedure with example. 2.5 Packages with example. 2.6 Attributes types. 2.7 Concept of Configuration.	12
Unit-III **VHDL Programming.**	3a. Write VHDL program for combinational circuit. 3b. Write VHDL program for sequential circuit. 3c. Explain different types of test bench**.** 3d. Write VHDL test bench for a circuit.	3.1 VHDL Program for combinational circuits – Gates, Multiplexer, Adder, Subtractor Encoder, Decoder, Demultiplexer. 4-bit ALU (simple) 3.2 VHDL Program for Sequential circuits – D, T and JK Flip-flop, UP/DOWN counter, MOD-counter, Shift registers. 3.3 Test Bench – Types, simple test bench for combinational circuit (Full Adder) and sequential logic circuit (UP/DOWN counter.)	12
Unit-IV **Finite State Machine.**	4a. Differentiate between Mealey and Moore machines. 4b. Design finite state machine from sequence detector and counter. 4c. Implement FSM using VHDL. 4d. Explain architecture of CPLD 4e. Explain architecture of FPGA.	4.1 Moore and Mealey Machines. 4.2 State diagram, encoding, reduction techniques. Design example (sequence detector and counter) of FSM using Mealy and Moore machine. 4.3 VHDL programming of Finite State Machines. 4.4 General architecture of PLA, PAL, CPLD and FPGA 4.5 Study of architecture of Xilinx CPLD. (Cool Runner) 4.6 Study of architecture of Xilinx FPGA. (Spartan-3)	12
Unit-V **Backend**	5a. Classify IC technology. 5b. Draw and explain MOSFET construction.	5.1 Classification of IC technology- SSI, MSI, LSI, VLSI, ULSI, GSI. 5.2 MOSFET Construction, Working and	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
VLSI	5c. Define Threshold voltage, Pinch-off voltage. 5d. Compare scaling types. 5e. Explain short channel effects. 5f. Explain IC fabrications steps. 5g. Understand concept of Latch-up in CMOS.	types, Threshold Voltage, Pinch-off Voltage, Body Effect, 5.3 Principle of MOSFET scaling, types of Scaling- constant voltage and constant field scaling. 5.4 Short Channel effects- Channel Length modulation, hot electron effect. 5.5 IC fabrication steps- oxidation, diffusion, Ion Implantation, Metallization, Photolithography in MOSFET, N-well, P-well and Twin Tube Methods. 5.6 Latch-up in CMOS and its prevention.	
Unit-VI **NMOS and CMOS Technology**	6a. Explain NMOS inverter with passive and active load. 6b. Explain CMOS inverter with Voltage transfer curve. 6c. Draw CMOS circuit for NOR, NAND and 3-variable equation. 6d. Implement Ex-OR and 2:1 Multiplexer using transmission gate. 6e. Draw stick diagram for CMOS NOT, NAND and NOR gate.	6.1 MOSFET inverter- NMOS Inverter with resistive load and NMOS Inverter with active load. 6.2 CMOS Inverter, Voltage transfer curve. Noise Margin 6.3 CMOS NOR and NAND gate with operation. 6.4 Realization of Boolean Equation using CMOS. (3-variable) 6.5 Transmission Gates, Implementation of EX-OR and 2:1 Multiplexer using Transmission Gates (TG) 6.6 Layout design rules, simple stick diagram for CMOS NOT, NAND and NOR gate. Layout of CMOS NOT gate.	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	**U Level**	**A Level**	**Total Marks**
I	Hardware Descriptive Language	04	06	02	12
II	Subprogram and Packages	04	04	04	12
III	VHDL Programming.	00	00	16	16
IV	Finite State Machine	04	04	04	12
V	Backend VLSI	04	06	04	14
VI	NMOS and CMOS Technology	02	04	08	14
	TOTAL	**18**	**24**	**38**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Write VHDL code, synthesis, simulate and test basic logic gates.	02
2	III	Write VHDL code, synthesis, simulate and test for 8: 1 multiplexer using VHDL.	02
3	III	Write VHDL code, synthesis, simulate and test for 2: 4 decoders using VHDL.	02
4	III	Write VHDL code, synthesis, simulate and test for half adder and Full Adder (using structural modeling)	02
5	III	Write VHDL code, synthesis, simulate and test for 8: 3 encoders.	02
6	III	Write VHDL code, synthesis, simulate and test for 4-bit comparator.	02
7	III	Write VHDL code, synthesis, simulate and test for simple 4-bit ALU.	02
8	III	Write VHDL code, synthesis, simulate and test for D and T-flip-flop.	02
9	III	Write VHDL code, synthesis, simulate and test for 4-bit up-down counter.	02
10	III	Write VHDL code, synthesis, simulate and test for 4-bit Shift register.	02
11	III	Write Test-bench for 4-bit up-down counter and verify results.	02
12	IV	Write VHDL code, synthesis, simulate and test for State diagram using VHDL.	02
13	IV	Study of Xilinx Spartan-3 FPGA.	02
14	IV	Write VHDL code and download on FPGA kit to interface and blink LEDs.	02
15	IV	Write VHDL code and download on FPGA kit to interface and to generate Waveforms using DAC.	02
16	VI	Design and simulate layout for CMOS NOT gate.	02
TOTAL			**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Prepare a chart of architecture of FPGA / CPLD
2. Prepare a chart showing simple CMOS circuits.
3. Download information regarding current FPGA / CPLD available in market.
4. Download animation explaining MOSFET fabrication process.
5. Develop simple project like – Traffic light system, Lift controller etc.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video/animation film to demonstrate the working of FPGA/CPLD
2. Arrange expert lecture of a person in the area of VLSI design.
3. Show video/animation film to demonstrate the working of MOSFET and its fabrications steps.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	VHDL Primer	J. Bhaskar	Prentice Hall of India.
2	VHDL programming by example	Douglas Perry	McGraw Hill, 4th Edition
3	Xilinx	Xilinx Manual	www.xilinx.com
4	CMOS Digital Integrated circuits.	Sung-Mo Kang, Yusuf Leblebici	Tata McGraw Hill Edition
5	Neil H. E. Weste Kamran Eshraghian	Principles of CMOS VLSI design	Pearson Education.
6	Douglas A. Pucknell, Kamran Eshraghian	Basic VLSI Design	Prentice Hall of India

B) Software/Learning Websites

1. http://www.asic-world.com/vhdl/index.html
2. www.nptel.ac.in

C) Major Equipments/ Instruments with Broad Specifications

1. Xilinx ISE Design Suit (Web version)
2. FPGA / CPLD Trainer Kit.
3. Computer system (Latest version)
4. Peripheral interface kits
5. Microwind Layout Editor Tool. (Web version)

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1			L	H							
CO2		M									
CO3			M	H							
CO4	L	L	M	H							
CO5	L	L	M	H							

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

PROGRAMME : Diploma Programme in Electronics and Telecommunication Engineering (EL)
COURSE : Industrial Automation (IAM) **COURSE CODE :** 6563

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

The aim of this course is to introduce students with present Industrial Automation scenario in India. The broad knowledge of essential component of present industrial Automation Industry such as Programmable Logic Controller (PLC), Distributed Control System (DCS).This course will explore automation system used in industries, DCS & PLC: its operation, usage, Instructions, hardware selection and configuration, applications, introductory programming examples and exercises and some troubleshooting hints of PLC system. Thus, this course is very important for students who want to use their knowledge of electronic engineering for working in industrial automation sector.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know the advanced automation system used in industrial as well as domestic level.
2. Understand different parts of PLC
3. Select PLC hardware configuration for given application.
4. Know the application of PLC Prepare a ladder logic Program for a given applications
5. Know the programming of PLC
6. Understand the system architecture & working of DCS

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain working of various building blocks of basic automation system.
2. Describe the functionality & connect different hardware used in PLC.
3. State & use different types of instructions for PLC programming.
4. Develop ladder diagrams for PLC programming for given applications
5. Design PLC based automation system applications
6. Describe the operation of different blocks of DCS

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Basics of Automation**	1a. Define automation system 1b. State different tools for automations 1c. Explain Automation system structure 1d. Describe Human interference subsystem	1.1 Automation – Definition, Need, Benefits, Different tools for automation, Automation system structure, Instrumentation subsystem Control subsystem 1.2 Human Interface subsystem 1.3 Operator Panel • Construction of the panel • Interfacing with control subsystem 1.4 Types of mimic panels	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.5 Advance Human Interface System • Intelligent Operator Panel • Operator Station • Data logging station	
Unit-II **PLC Hardware**	2a. Explain discrete input & output module 2b. Draw the block diagram & wiring diagram of AC, DC, analog discrete input & output module 2c. State the specification for discrete I/O module 2d. State the selection criteria for I/O module	2.1 Discrete input modules: • AC input modules - block diagram, description, typical wiring details and specifications. • DC input modules - block diagram, description, typical wiring details, sinking and sourcing concept & specifications. • Analog input modules- block diagram, description, typical interfacing of input devices & specifications. 2.2 Discrete output modules: • AC output modules - block diagram, description, typical wiring and specifications. • DC output modules - block diagram, description, typical wiring details, sinking and sourcing connections & specifications. Relay and Isolated o/p modules. (Only description) • Analog output modules- block diagram, description, typical wiring details & specifications. 2.3 I/O module, selection criterion	10
Unit-III **I/O Addressing of PLC**	3a. Explain and use relay, Timer, Counter, Comparison, Data handling, Logical, arithmetic instructions 3b. Describe how different simple Timer, Counter, Comparison, Data handling, Logical, arithmetic operations can be performed by PLC. 3c. Describe PLC sequencer functions 3d. Explain subroutine for PLC 3e. Describe PID functions.	3.1 Relay type instructions - NO, NC, One shot, Latch and Unlatch. 3.2 Timer instructions - On delay timer, off delay timer, Retentive timer and Timer reset. 3.3 Counter instructions - up counter, down counter, high speed counter, counter reset. 3.4 Comparison instructions – Equal, Not equal, Greater, Greater than equal, Less, Less than equal. 3.5 Data handling instructions – Move, Masked Move and Limit test. 3.6 Logical instructions – AND, OR, EX-OR, NOT. 3.7 PLC arithmetic function : Addition, Subtraction Multiplication, Division, Square root Negative, Average	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		3.8 Miscellaneous instructions – Sequencer instructions, scale with parameter, subroutine and PID instructions.	
Unit-IV **PLC Programming**	4a. List out different types of PLC Programming languages. 4b. Describe general programming procedure 4c. List out different instructions 4d. State the basic concept of ladder 4e. State the rules of ladder diagram 4f. Develop the ladder diagram for simple examples like applications related to Timer, Counter, Comparison, Data handling, Logical & arithmetic	4.1 Different PLC programming languages (only introduction) - FBD, Instruction list, structured text, sequential function chart, 4.2 Basic concept of ladder, Rules of ladder 4.3 Simple programming examples using ladder programming language based on relay, timer, counter, logical, comparison, Data handling and miscellaneous instruction	12
Unit-V **Applications of PLC**	5a. Draw system diagram for given application 5b. Draw logical connection diagram for simple automation system 5c. Develop ladder diagram for simple automation system 5d. Connect input & output modules for simple automation system 5e. State the trouble shooting procedure for PLC system	5.1 System diagram, logic, I/O listing, ladder diagram's of • Motor sequence control. • Traffic light control. • Elevator control. • Tank level control. • Reactor control. • Conveyor system. • Batch process Control • Drum/Bottle Filling System • Stepper motor control. • Speed Control of AC/ DC Motor 5.2 Trouble shooting of PLC	12
Unit-VI **Introduction to DCS**	6a. Explain concept of DCS 6b. Draw and describe hierarchy of DCS. 6c. describe functions of each level of DCS 6d. explain different system elements of DCS 6e. state 5 Selection criteria of DCS 6f. State Strengths and limitations of DCS	6.1 Introduction to DCS, concept of DCS, hierarchy of DCS 6.2 DCS architecture, function of each level of DCS 6.3 Database organization in DCS 6.4 System elements of DCS • Field station • Intermediate station • Central computer station 6.5 Selection criteria of DCS 6.6 Advantages & limitations of DCS 6.7 Applications of DCS	10
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Basics of Automation	04	04	04	12

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
II	PLC Hardware	06	04	04	14
III	I/O Addressing of PLC	06	04	04	14
IV	PLC Programming	04	04	06	14
V	Applications of PLC	04	04	06	14
VI	Introduction to DCS	04	04	04	12
	TOTAL	**28**	**24**	**28**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Identify continuous, discrete control and composite control system.	02
2	III	Verify the functions of logic gates by using PLC	02
3	IV	Develop & test Ladder program for Start stop logic using two inputs.	02
4	IV, V	Develop & test Ladder program for push to start and push to stop. (Use single Push Button)	02
5	IV, V	Develop & test Ladder program for blinking of LED's.	02
6	IV, V	Develop& verify ladder program for sequential ON-Off control of Lamps	02
7	V	Develop & verify ladder program for sequential control of DC motors	02
8	V	Develop ladder program for stepper motor. Verify its operation	02
9	V	Simulate Timers for Traffic Control. verify its operation	02
10	IV, V	Interface thermocouple/RTD as an analog sensor with PLC. verify its operation	02
11	IV, V	Develop temperature On-Off control loop using PLC. verify its operation	02
12	III	Use of sequencer instructions for stepper motor control.	02
13	IV, V	Develop ladder program for automated parking system. verify its operation	02
14	IV	Simulate PLC based conveyor system. verify its operation	02
15	IV	Simulate PLC based Elevator system. verify its operation	02
16	VI	Test the DCS functionality	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities like

1. Develop a small project using MULTISIM software
2. Collect the information related to sensors used for industrial automation system
3. Assemble PLC hardware on PLC trainer

4. Collect the specifications of different PLC used for industrial purpose
5. Develop ladder diagram for any one industrial application
6. Prepare & Present seminar on any one topic related to the course
7. Prepare a case study on industrial automation system

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Arrange industrial visit to study industrial automation system
2. Expert lecture on automation system from person from industry
3. Show videos /power point presentation PLC basic, industrial automation system and DCS

9.0 LEARNING RESOURCES:

A) Books

Sr. No.	Title of Book	Author	Publication
1	Introduction to Programmable logic control	Gary Dunning	Cenage Learning
2	Programmable logic controllers	F.D. Petruzella	Tata- McGraw-Hill, New Delhi (Third edition)
3	Programmable logic controllers	John Hackworth and Federic Hackworth	Pearson education
4	Industrial automation and process control	Jon Stenerson	Prentice Hall
5	Programmable logic controllers	V. R. Jadhav	Khanna Publishers, New Delhi
6	Distributed Computer Control for Industrial Automation	Popovic & Bhatkar	CRC Press, New Delhi,
7	Computer Based Industrial Control	Krishna Kant	PHI, New Delhi,

B) Software/Learning Websites

1. PLC simulator (freeware)
2. DCS simulator
3. MULTISIM

C) Learning Websites

1. www.control.com
2. www.plcs.net
3. http://plc-training
4. www.triplc.com
5. www.plcsimulator.net/
6. http://www.automationdirect.com

D) Major Equipments/ Instruments with Broad Specifications

1. DCS Trainer Set-up or Simulation Software IEC 1131- 3 Compatible Software
2. PLC's, sensors and Transmitters, PC server, Two work Stations
3. Programmable Logic controllers Trainer Set-up or Simulation Software from standard vendors.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		M	M	M	M					
CO2	H	M	H	H	H	M					
CO3	H		H	H	H	H					
CO4	H	M	H	H	H	H					
CO5	H	H	H	H	H	H					
CO6	H		H	H		M					

H: High Relationship, M: Moderate Relationship, L: Low Relationship.

Annexure : I

Rules for Registration and Examination

Important Rules of Registration for courses.

1. An eligible student must register to minimum three courses and maximum seven courses during each term.
2. While registering for a course at the beginning of a term, a student shouldn't have backlog of more than seven courses of any term as carried over due to failure or any other reason.
3. A student can register for a Project work only after acquiring minimum 100 credits.
4. A student will have to re - register for a course/s if he / she is detained from the course/s for any reason.

Important Rules regarding Registration for Examination

1. A student can register for examination of only those courses for which he has registered and kept term.
2. A student can register for examination for not more than 10 courses in one examination.
3. A student will have to re-register for examination of theory or Practical / oral of a course if he / she fails in examination.
4. A student will be allowed to re-register for examination in accordance with rules if he / she was eligible to appear for last Examination but he/ she failed to appear last examination for any reason.
5. A student will not be able to cancel his registration after he / she is Registered for examination

Other Important Rules

1. A candidate will be eligible for the award of diploma when he / she acquires the required number of credits for a Programme.
2. No candidate will be allowed to appear for examination of any course unless the Head of the Department certifies that
   - 2.1 Attended at least 75% of the prescribed lecture hours, tutorial hours, practical hours or any other kind of work and or assignment for the course as the case may be in conformity with the provision laid down in the course contents.
   - 2.2 Satisfactorily completed specified laboratory practical, term work prescribed in curriculum for the course.
3. No candidate will be permitted to reappear to any course of any examination in which he has once passed.

Standard of Passing

1. Theory, total of theory and periodic test, practical, oral and termwork examination shall be separate head of passing.
2. To pass examination of any course, a candidate must obtain a minimum of 40% marks in each head of passing prescribed for that course taken separately.

Periodic Test

1. Two periodic tests will be conducted during each term for the courses as per their examination scheme.
2. Average marks of the two period tests will be considered for each course separately.
3. Reappearing for the periodic test for improvement of marks is not allowed.

Term Work

1. Term work is a document submitted by the candidate consisting of report of site / field visit and / or laboratory work and / or drawing sheets / sketch books / jobs / model. Such term work shall be submitted before the end of academic term and it shall be satisfactory in the opinion of concern faculty member, Head of the Department and Principal of Institute.

Grace Marks

1. Grace marks shall be applicable if the rules of "standards of passing" are fulfilled.
2. The grace of maximum three marks will be given in either in "Theory marks", or "Periodic test" or "total of theory and periodic test marks", if it falls short by maximum three marks to pass a course.
3. The grace of maximum three marks shall not be applicable twice for the same course. i.e. for "theory" and "total of theory and periodic test" of same course.
4. The grace marks are not applicable to practical, oral, term work examination.

Award of Class

First Class with Distinction	:	70% or more
First Class	:	60% and above but less than 70%
Second Class	:	50 % and above but less than 60%
Pass Class	:	40% and above but less than 50 %

Annexure : II

Evaluation Scheme for Project

Term Work : Max. Marks : 50 Min. Marks : 20.
Oral : Max. Marks : 50 Min. Marks : 20.

Progressive Assessment

Name of the student: Enrolment No.:
Term : II / III ODD / EVEN
Programme: Electronics and Telecommunication Engineering
Course : Project **Code :** 6412 **Project Guide :**

Title of Project :

SN	Project Activities	Date / Week	Leader ship	Understanding	Observation &Accuracy	Contribution	Timely Completion	Total	Signature of Student	Signature of Guide	Signature of HOD
			5	5	5	5	5	25			
1	Formation of team & finalization of project	1									
2	Submission of synopsis : by each group	2									
3	Project activity plan	3									
4	Maintenance Project Diary	6									
5	Visits to Industries / Institutions / Market	7									
6	Collection of Data / Survey	9									
7	Analysis and Presentation of data.	10									
8	Pre submission seminar	13									
9	Presentation of Rough Work : hand written	14									
10	Final Project Report : Submission	15									
	Total by Internal : out of 250										

The Term Work : Convert the total given by internal to "out off 25".

Signature of Project Guide

Project assessment :

Term Work			**Oral**		
Internal	External	Total	Internal	External	Total
25	25	50	25	25	50

Annexure : III

Committees

1. Governing Body (GB)

Sr. No	Name & Office Address	Governing Body Designation
1.	**Shri. Pramod Naik** Joint Director, Directorate of Technical Education, M.S. Mumbai	Chairman
2.	**Shri. Mahendra Kothari** Chairman, Maharashtra State Pipe & Allied Industry, D-5, MIDC Satpur, Nashik.	Member
3.	**Shri. Ashok Katariya** Chairman, Ashoka Group of Companies, Ashoka House, Ashoka Marg, Nashik.	Member
4.	**Dr. Ramesh Unnikrishnan** Regional Officer and Director, Regional Office, (AICTE) Regional Office, Western Region, Mumbai.	Member
5.	**Shri. B. S. Joshi** The Joint Director, Industries, Regional Office, Nashik	Member
6.	**Shri. V. D. Patil** Coordinator, NITTR-Bhopal Extension Center, Pune.	Member
7.	**Shri. S. P. Wagh** Chairman, Consumer Grievances Redressal M.S.E. Dist.Co.Ltd, Nashik	Member
8.	**Shri. Kishor Patil** Institute Of Career & Skills, 3, Adgaonkar plaza basement, ABB circle, Mahatma Nagar, Nashik-422007	Member
9.	**Shri. Harishankar Banerjee** President, NIMA, MIDC, Satpur, Nashik.	Member
10.	**Shri. F. A. Khan** Principal, Govt. Polytechnic, Aurangabad.	Member
11.	**Shri. Manish Kothari** Chairman, Institution of Engineers Nashik Local Centre, Nahik.	Member
12.	**Prof. Dnyandeo P. Nathe** Principal, Government Polytechnic, Nashik	Member Secretary

2. Board of Studies (BOS)

Sr. No.	Name & Office address	BOS Designation
1	**Shri. S. P. Wagh** Chairman, Consumer Grievances Redressal M.S.E. Dist.Co.Ltd, Nashik	Chairman
2	**Shri. Sunil Bhor** Project Management Consultant, 659/A wing second floor market, Shopping complex Dindori Road, Nashik.	Member
3	**Shri. Bhalchandra R. Patwardhan** Plot No.24, Atharva Raw House, Bhavik Nagar, Gangapur Road, Nashik-13.	Member
4	**Shri. Kishor T. Patil** Institute Of Career & Skills, 3, Adgaonkar plaza basement, ABB circle, Mahatma Nagar, Nashik-422007	Member
5	**Shri. Kishor Vyas** Digilog System Pvt. Ltd., 15, Shriram sankul, Opp. Hotel Panchavati, Vakilwadi, Nashik.	Member
6	**Shri. Chandrashekhar. B. Dahale** F1, Computer Service, No. 2, Sukhraj, Near Parijatnagar bus stop,Nashik 422005	Member
7	**Shri. M. M. Dube** Sr. Executive, Systems, M & Q, C-1, MIDC, Ambad, Nashik-10	Member
8	**Shri. Anant Tagare** Principal Engineer, Validation, Mahindra & Mahindra Ltd., R & D Centre, 89, MIDC, Satpur, Nashik-422007	Member
9	**Shri. Aaush Potdar** Director, Poddar Clothing Industries, Nashik.	Member
10	**Shri. Vijay Sanap** Architect & Consultant, Soham Constructions, Nashik.	Member
11	**Shri. Pramod U. Wayse** Deputy Secretary (T), MSBTE, Regional Office, Osmanpura, Aurangabad-431005.	Member
12	**Shri. P. T. Kadve** Principal, K.K. Wagh Polytechnic, Nashik.	Member
13	**Shri. R. N. Vaidya** HOD, Civil Engg., Govt. Polytechnic, Nashik.	Member
14	**Shri. S. R. Deshkukh** HOD, Civil Engg (II Shift), Govt. Polytechnic, Nashik	Member
15	**Dr. C. Y. Seemikeri** HOD, Mechanical Engg., Govt. Polytechnic, Nashik.	Member
16	**Dr. Sanjay Ingole** HOD, Mechanical Engg (II Shift), Govt. Polytechnic, Nashik	Member
17	**Shri. J. B. Modak** I/C, HOD, Plastic Engg., Govt. Polytechnic, Nashik.	Member
18	**Shri. L. S. Patil** I/C, HOD, Electrical Engg., Govt. Polytechnic, Nashik.	Member

Sr. No.	Name & Office address	BOS Designation
19	**Shri. Yogesh Sanap** I/C, HOD, Information Technology. & Computer. Technology, Govt. Polytechnic, Nashik.	Member
20	**Shri. A. S. Laturkar** HOD, Electronics and Telecommunication Engg., Govt. Polytechnic, Nashik.	Member
21	**Dr. S. D. Pable** HOD, Electronics and Telecommunication Engg (II Shift), Govt. Polytechnic, Nashik	Member
22	**Shri. T. G. Chavan** I/C, HOD Automobile Engg., Govt. Polytechnic, Nashik.	Member
23	**Ms. T. J. Mithari** I/C, HOD, Dress Design & Garment Manufacturing, Govt. Polytechnic, Nashik	Member
24	**Ms. N. P. Adke** I/C,HOD, Interior Design & Decoration, Govt. Polytechnic, Nashik	Member
25	**Shri. V. H. Chaudhari** I/C, Training & Placement Officer, Govt. Polytechnic, Nashik	Member
26	**Shri. G. G. Wankhede** Controller of Examination, Govt. Polytechnic, Nashik.	Member
27	**Shri. S. P. Dikshit** Lecturer in Civil Engg., I/C CDC, Govt. Polytechnic, Nashik	Member Secretary

3. Programme wise committee(PWC)

Sr. No.	Name & Office address	PWC Designatic
1	**Shri. A. S. Laturkar** HOD, Electronics & Telecommunication Engg. Dept., Govt. Polytechnic, Nashik.	Chairman
2.	**Dr. S. D. Pable** H.O.D. Electronics &Telecommunication Engg. Dept. (second shift), Govt. Polytechnic, Nashik.	Member
3	**Shri. Anand Gharpure** SONIC Multitech Pvt. Ltd., Nashik**.**	Member
4	**Shri. Prashant Suryavanshi** Surya Technologies, G16, Ujjwal Terraces, Dhayari, Pune - 51	Member
5	**Shri. B. L. Kulkarni** H.O.D. E & TC Dept., Amrutvahini Polytechnic, Sangamner	Member
6	**Shri. M. R. Patil** Lecturer in Electronics Engg., Govt. Polytechnic Nashik	Member
7	**Dr. J. G. Joshi** Lecturer in Electronics Engg., Govt. Polytechnic, Nashik	Member
8	**Shri. Pramod U. Wayse** Deputy Secretary (T), MSBTE, Regional Office, Osmanpura, Aurangabad-431005.	Member
9	**Shri. S. P. Dikshit** Lecturer, Civil Engg. Dept., Incharge CDC, Govt. Polytechnic, Nashik.	Member secretary

4. PROGRAMME CURRICULUM DEVELOPMENT COMMITTEE

Institute Level Curriculum Development Cell

Sr. No.	Name of the Faculty	Designation
1	Prof. D. P. Nathe	Principal, Government Polytechnic, Nashik
2	Shri. R. N. Vaidya	Head of Civil Engineering Department and Academic co-ordinator, Government Polytechnic Nashik
3	Shri. S. P. Dikshit	CDC Incharge, Lecturer in Civil Engineering, Government Polytechnic, Nashik
4	Dr. N. L. Patil	Lecturer in Civil Engineering, Government Polytechnic, Nashik.
5	Dr. S. V. Bhangale	Lecturer in Electrical Engineering, Government Polytechnic, Nashik.
6	Dr. S. J. Gorane	Lecturer in Mechanical Engineering, Government Polytechnic, Nashik.
7	Shri. N. N. Thakare	Lecturer in Plastic Engineering, Government Polytechnic, Nashik.

Department Level Committee

Sr. No.	Name of the Faculty	Designation
1	Shri. A. S. Laturkar	H.O.D. Electronics & Telecommunication Engg., Dept., Government Polytechnic Nashik
2	Shri. S. S. Prabhune	Lecturer in Electronics Engg., Government Polytechnic Nashik
3	Dr. J. G. Joshi	Lecturer in Electronics Engg., Government Polytechnic, Nashik.
4	Shri. B. M. Chaudhari	Lecturer in Electronics Engg., Government Polytechnic, Nashik
5	Shri. V.S. Thakare	Lecturer in Electronics Engg., Government Polytechnic, Nashik.

NITTTR, Bhopal Committee

Sr. No.	Name of the Faculty	Designation
1	Prof. R. G. Chouksey	Dean Student Welfare, Department of Vocational Education and Entrepreneurship Development, NITTTR, Bhopal.
2	Dr. Nishith Dubey	Professor, Department of Vocational Education and Entrepreneurship Development, NITTTR, Bhopal.

5. Contributors to Course Curriculum Development

Sr. No.	Name of the Faculty	Designation
1	Dr. A. R. Thete	Consultant. Director Center For Development of Leadership in Education Pvt. Ltd. Aurangabad.

Sr. No.	Name of the Faculty	Designation
2	**Electronics & Telecommunication Engineering Department, Government Polytechnic Nashik**	
	Shri. A. S. Laturkar	H.O.D. Electronics & Telecommunication Engg. Dept.
	Shri. M. R. Patil	I/C H.O.D. Electronics & Telecommunication Engg. Dept. (second shift)
	Shri. S. S. Prabhune	Lecturer in Electronics Engineering
	Dr. J. G. Joshi	Lecturer in Electronics Engineering
	Mrs. M. M. Shinde	Lecturer in Electronics Engineering
	Mrs. V. B. Patil	Lecturer in Electronics Engineering
	Shri. V. P. Tayade	Lecturer in Electronics Engineering
	Shri. M. V. Patil	Lecturer in Electronics Engineering
	Shri. P. D. Deshpande	Lecturer in Electronics Engineering
	Shri. V. S. Thakare	Lecturer in Electronics Engineering
	Shri. M. D. Raut	Lecturer in Electronics Engineering
	Mrs. S. S. Chaudhari	Lecturer in Electronics Engineering
	Shri. D. B. Borude	Lecturer in Electronics Engineering
	Shri. B. M. Chaudhari	Lecturer in Electronics Engineering
3	**Applied Mechanics Department, Government Polytechnic Nashik**	
	Shri. R. G. Sonone	Co-ordinator and Lecturer in Applied Mechanics
	Shri. S. P. Pagare	Lecturer in Applied Mechanics
	Shri. V. R. Gaikwad	Lecturer in Applied Mechanics
4	**Civil Engineering Department, Government Polytechnic Nashik**	
	Dr. S. S. Pathak	Lecturer in Civil Engineering
4	**Mechanical Engineering Department, Government Polytechnic Nashik**	
	Shri. S. P. Muley	I/C Head of Department
	Shri. R. V. Rupavate	I/C Head of Department (second shift)
	Shri. S. D. Sanap	Lecturer in Mechanical Engineering
	Dr. S. G. Gorane	Lecturer in Mechanical Engineering
	Shri. P. S. Kulkarni	Lecturer in Mechanical Engineering
	Shri. K. A. Jagtap	Lecturer in Mechanical Engineering
	Shri. Y. S. Kokate	Lecturer in Mechanical Engineering
	Shri. A. G. Waghulde	Lecturer in Mechanical Engineering
5	**Other Departments, Government Polytechnic Nashik**	
	Shri. P. G. Kochure	Workshop Superintendent
	Dr. K. V. Nemade	Controller of Examination, Lecturer in Automobile Engineering
	Dr. S. V. Bhangale	Lecturer in, Electrical Engineering

Sr. No.	Name of the Faculty	Designation
6	**Science and Humanities Department, Government Polytechnic Nashik**	
	Shri. S. M. Shinde	Lecturer in Mathematics
	Mrs. A. S. Salunkhe	Lecturer in Mathematics
	Shri. C. N. Pagare	Lecturer in Chemistry
	Shri. S. A. Padwal	Lecturer in Physics
	Shri. R. P. Landage	Lecturer in English
	Mrs. A. N. Patil	Lecturer in Chemistry
	Mrs. Y. S. Patil	Lecturer in Physics
	Mrs. P. S. Joshi	Lecturer in English
	Mrs. K. S. Shinde	Lecturer in Chemistry
	Dr. Mrs. K. D. Talele	Lecturer in Physics

Certificate

The curriculum of the programme has been revised in the year 2016, as per the provision made in curriculum development process of Government Polytechnic, Nashik. This is the **outcome based Curriculum of Diploma in Electronics and Telecommunication Engineering programme**, which shall be implemented from academic year 2016-17.

Verified by

Department Level CDC Representative
Government Polytechnic, Nashik

Head of Department
Electronics and Telecommunication Engineering
Government Polytechnic, Nashik

Incharge, Curriculum Development Cell
Government Polytechnic, Nashik.

Principal
Government Polytechnic, Nashik.