ST. XAVIER'S TECHNICAL INSTITUTE

Mahim, Mumbai 400 016

A Govt. Aided Autonomous and Minority Institute
Recognised by Govt. of Maharashtra
Approved by A.I.C.T.E.

A JESUIT INSTITUTE

DIPLOMA IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Revised Curriculum For

Diploma Programme in Electronics and Telecommunication Engineering

Academic Year 2021-22

Dr. Shivaji Ghungrad
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ST. XAVIER'S TECHNICAL INSTITUTE, MAHIM, MUMBAI 400 016
Diploma in Electronics & Telecommunication Engineering

REVISED AND EFFECTIVE FROM JULY 2018	TEACHING AND EXAMINATION SCHEME	SEMESTER ONE

ACADEMIC YEAR 2021-22		TEACHING SCHEME					EXAMINATION SCHEME				
SR.NO	SUBJECT TITLE	SUBJECT CODE	TH	TU	PR	CREDITS	THEORY		PRACTICAL / ORAL		GRAND TOTAL
							ESA	PA	ESA	PA	
1	Basic Mathematics	ET-18111	4	1	XX	5	80	20	XX	XX	100
2	Basic Electronics	ET-18121	4	XX	4	8	80	20	50	25	175
3	Basic Electrical Engineering	ET-18113	4	XX	2	6	80	20	50	25	175
4	Computer Applications	ET-18115	XX	XX	2	2	XX	XX	50 (ONLINE EXAM)	25	75
5	Electronic Materials & Components	ET-18116	2	2	XX	4	XX	XX	50 (ONLINE EXAM)	50	100
6	Professional Practices	ET-18117	2	XX	XX	2	XX	XX	XX	50	50
7	English Language	ET-18118	4	XX	2	6	80	20	XX	50	150
		Total	20	3	10	33	320	80	200	225	825

ET-18120 represents “Yoga” which is Non-Credit and Non-Exam in First Semester of 1 Hour/ Week

Total Number of Credits = 33 , Total Number of Student Contact Hours = 34 — Total Marks = 825

Abbreviations		
	TH	Theory
	TU	Tutorial
	PR	Practical
	XX	No TW/EXAM(TH/PR/OR/ Online)
	ESA	End Semester Exam
	PA	Progressive assessment

- For progressive and continuous assessment two periodic tests of 20 marks each are for all the theory subjects. The average of these is added to the final theory examination marks, which is of 70 marks (except for online examinations).
- All term work marks are Internal.
- All practical exams/ oral are External and Internal .
- All online exams are Internal

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REVISED AND EFFECTIVE FROM JANUARY 2019	TEACHING AND EXAMINATION SCHEME	SEMESTER TWO

ACADEMIC YEAR 2021-22		TEACHING SCHEME					EXAMINATION SCHEME				
SR.NO	SUBJECT TITLE	SUBJECT CODE	TH	TU	PR	CREDITS	THEORY		PRACTICAL / ORAL		GRAND TOTAL
							ESA	PA	ESA	PA	
1	Engineering Mathematics	ET-18211	3	1	xx	4	80	20	xx	xx	100
2	Applied Electronics	ET-18222	3	xx	4	7	80	20	50	25	175
3	Electronic Circuits & Applications	ET-18223	3	xx	4	7	80	20	50	25	175
4	Engg. Drawing & C.A.D.	ET-18215	xx	xx	2	2	xx	xx	50	25	75
5	Electrical Machines	ET-18216	3	xx	2	5	80	20	50	25	175
6	Electronics Workshop	ET-18217	xx	xx	2	2	xx	xx	xx	50	50
7	Environmental Science *	ET-18219	2	xx	2	4	xx	xx	(Online exam) 100	50	150
8	Communication Skills	ET-18224	2	2	xx	4	xx	xx	xx	50	50
		Total	16	3	16	35	320	80	300	250	950

Total Number of Credits = 35, Total Number of Student Contact Hours = 35	Total Marks =	950

Abbreviations		
	TH	Theory
	TU	Tutorial
	PR	Practical
	XX	No TW/EXAM(TH/PR/OR/ Online)
	ESA	End Semester Exam
	PA	Progressive assessment

- For progressive and continuous assessment two periodic tests of 20 marks each are for all the theory subjects. The average of these is added to the final theory examination marks, which is of 70 marks (except for online examinations).
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- All practical exams/ oral are External and Internal .
- All online exams are Internal

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REVISED AND EFFECTIVE FROM JULY 2019	TEACHING AND EXAMINATION SCHEME	SEMESTER THREE

ACADEMIC YEAR 2021-22		TEACHING SCHEME					EXAMINATION SCHEME				
SR.NO	SUBJECT TITLE	SUBJECT CODE	TH	TU	PR	CREDITS	THEORY		PRACTICAL / ORAL		GRAND TOTAL
							ESA	PA	ESA	PA	
1	Applied Mathematics	ET-18311	3	1	xx	4	80	20	xx	xx	100
2	Principles of Communication I*	ET-18312	4	xx	2	6	80	20	50	25	175
3	Electronic Test Instruments	ET-18313	3	xx	2	5	80	20	50	25	175
4	'C' Programming *	ET-18314	2	xx	4	6	xx	xx	50	25	75
5	Linear Integrated Circuits	ET-18315	4	xx	2	6	80	20	50	25	175
6	Circuit Building I	ET-18319	xx	xx	4	4	xx	xx	xx	50	50
7	Academic Skills	ET-18317	xx	xx	2	2	xx	xx	xx	xx	xx
		Total	16	1	16	33	320	80	200	150	750

*ET-18320 represents “Yoga” which is non-credit and non-exam in 3rd Semester of 2 hours per week

Total Number of Credits = 33, Total Number of Student Contact Hours = 35 — Total Marks = 750

Abbreviations		
	TH	Theory
	TU	Tutorial
	PR	Practical
	XX	No TW/EXAM(TH/PR/OR/ Online)
	ESA	End Semester Exam
	PA	Progressive assessment

- For progressive and continuous assessment two periodic tests of 20 marks each are for all the theory subjects. The average of these is added to the final theory examination marks, which is of 70 marks (except for online examinations).
- All term work marks are Internal.
- All practical exams/ oral are External and Internal .
- All online exams are Internal

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Diploma in Electronics & Telecommunication Engineering

REVISED AND EFFECTIVE FROM JANUARY2020	TEACHING AND EXAMINATION SCHEME	SEMESTER FOUR

ACADEMIC YEAR 2021-22		TEACHING SCHEME					EXAMINATION SCHEME				
SR.NO	SUBJECT TITLE	SUBJECT CODE	TH	TU	PR	CREDITS	THEORY		PRACTICAL / ORAL		GRAND TOTAL
							ESA	PA	ESA	PA	
1	Entrepreneurship	ET-18411	3	xx	2	5	xx	xx	(Online exam) 50	50	100
2	Principles of Communication II	ET-18412	3	xx	2	5	80	20	50	25	175
3	Digital Electronics	ET-18413	3	xx	2	5	80	20	50	25	175
4	Circuits and Networks	ET-18415	3	xx	2	5	80	20	50	25	175
5	Software Simulation Techniques	ET-18416	xx	xx	2	2	xx	xx	xx	50	50
6	Circuit Building II	ET-18419	xx	xx	4	4	xx	xx	xx	50	50
7	Industrial Electronics	ET-18420	3	xx	2	5	80	20	50	25	175
8	Academic Skills	ET-18421	xx	xx	2	2	xx	xx	xx	xx	xx
		Total	15	0	18	33	320	80	250	250	900

ET-18423 represents Sports And Cultural which is non-credit and non-exam in 4th Semester of 2 hours/week

Total Number of Credits = 33, Total Number of Student Contact Hours = 35 | Total Marks = 900

Abbreviations		
	TH	Theory
	TU	Tutorial
	PR	Practical
	X	No TW/EXAM(TH/PR/OR/ Online)
	ESA	End Semester Exam
	PA	Progressive assessment

- For progressive and continuous assessment two periodic tests of 20 marks each are for all the theory subjects. The average of these is added to the final theory examination marks, which is of 70 marks (except for online examinations).
- All term work marks are Internal.
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REVISED AND EFFECTIVE FROM JULY 2020	TEACHING AND EXAMINATION SCHEME	SEMESTER FIVE

ACADEMIC YEAR 2021-22		TEACHING SCHEME					EXAMINATION SCHEME				
SR.NO	SUBJECT TITLE	SUBJECT CODE	TH	TU	PR	CREDITS	THEORY		PRACTICAL / ORAL		GRAND TOTAL
							ESA	PA	ESA	PA	
1	Microprocessors and Microcontrollers	ET-18519	4	xx	2	6	80	20	50	25	175
2	Signals and Systems	ET-18512	3	1	2	6	80	20	50	25	175
3	Advanced Communication Systems	ET-18513	4	xx	2	6	80	20	50	25	175
4	Project I	ET-18514	xx	xx	2	2	xx	xx	xx	50	50
5	Basic Control Systems (E1)	ET-18520	4	xx	2	6	80	20	50	25	175
6	Vocational Training	ET-18516	xx	xx	6	(4+2)=6	xx	xx	50	50	100
7	Circuit Simulation and PCB Design	ET-18517	xx	xx	2	2	xx	xx	50	25	75
8	PLC Systems and Applications (E1)	ET-18518	4	xx	2	6	80	20	50	25	175
		Total	15	1	18	34	320	80	300	225	925

Total Number of Credits, Student Contact Hours = 34	Total Marks =	925

Abbreviations		
	TH	Theory
	TU	Tutorial
	PR	Practical
	XX	No TW/EXAM(TH/PR/OR/ Online)
	ESA	End Semester Exam
	PA	Progressive assessment
	E1	Elective One

- For progressive and continuous assessment two periodic tests of 20 marks each are for all the theory subjects. The average of these is added to the final theory examination marks, which is of 70 marks (except for online examinations).
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- All practical exams/ oral are External and Internal .
- All online exams are Internal

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REVISED AND EFFECTIVE FROM JANUARY 2021	TEACHING AND EXAMINATION SCHEME	SEMESTER SIX

ACADEMIC YEAR 2021-22

SR.NO	SUBJECT TITLE	SUBJECT CODE	TEACHING SCHEME TH	TU	PR	CREDITS	EXAMINATION SCHEME THEORY ESA	THEORY PA	PRACTICAL / ORAL ESA	PRACTICAL / ORAL PA	GRAND TOTAL
1	Mobile Communication(E2)	ET-18611	4	xx	2	6	80	20	50	25	175
2	Digital Signal Processing	ET-18612	3	1	2	6	80	20	50	25	175
3	Data Commn. & Comp. Networking(E2)	ET-18613	4	xx	2	6	80	20	50	25	175
4	Digital Communication	ET-18614	4	xx	2	6	80	20	50	25	175
5	Mechatronics(E3)	ET-18619	4	xx	2	6	80	20	50	25	175
6	Project II	ET-18616	xx	xx	4	4	xx	xx	50	50	100
7	Advanced Power Electronics (E3)	ET-18617	4	xx	2	6	80	20	50	25	175
8	Scilab	ET-18618	xx	xx	2	2	xx	xx	xx	50	50
9	Industrial Management and Quality Control (IMQC)	ET-18620	3	xx	xx	3	80	20	xx	xx	100
10	Technical Writing	ET-18621	xx	xx	2	2	xx	xx	xx	50	50
		Total	18	1	16	35	400	100	250	250	1000

Total Number of Credits, Student Contact Hours = 35 — Total Marks = 1000

Abbreviations			
		TH	Theory
		TU	Tutorial
		PR	Practical
		XX	No TW/EXAM(TH/PR/OR/ Online)
E2, E3	Elective Two and Three	ESA	End Semester Exam
		PA	Progressive assessment

- For progressive and continuous assessment two periodic tests of 20 marks each are for all the theory subjects. The average of these is added to the final theory examination marks, which is of 70 marks (except for online examinations).
- All term work marks are Internal.
- All practical exams/ oral are External and Internal .
- All online exams are Internal

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REVISED AND EFFECTIVE FROM JULY 2018	SUMMARY OF TEACHING / WEEK, CREDITS AND EXAMINATION SCHEME	SEMESTER ONE - SIX

ACADEMIC YEAR 2021-22		TEACHING SCHEME				EXAMINATION SCHEME				
SR.NO	SUBJECT TITLE	TH	TU	PR	CREDITS	THEORY		PRACTICAL / ORAL		GRAND TOTAL
						ESA	PA	ESA	PA	
1	Semester -- 1	20	3	10	33	320	80	200	225	825
2	Semester -- 2	16	3	16	35	320	80	300	250	950
3	Semester -- 3	16	1	16	33	320	80	200	150	750
4	Semester -- 4	15	0	18	33	320	80	250	250	900
5	Semester -- 5	15	1	18	34	320	80	300	225	925
6	Semester -- 6	18	1	16	35	400	100	250	250	1000
Total		100	09	94	203	2000	500	1500	1350	5350

ST. XAVIER'S TECHNICAL INSTITUTE, MAHIM, MUMBAI 400 016

Diploma in Electronics and Telecommunication Engineering

Revised in July 2017 and Effective from Dec 2020 / Jan 2021

TEACHING AND EXAMINATION SCHEME

SEMESTER SIX *

Academic Year 2021-2022

Sr. No.	Subject Title	Subject Code	Teaching Scheme				Examination Scheme									
			TH*	TU	PR	CREDITS	PAPER HRS	THEORY		PRACTICAL		ORAL		TERM WORK		TOTAL
								Max	Min	Max	Min	Max	Min	Max	Min	
1	Mobile Communication(E2)	ET-18611	4	xx	2	6	3	100	40	xx	xx	50	20	25	10	175
2	Digital Signal Processing	ET-18612	3	1	2	6	3	100	40	50	20	xx	xx	25	10	175
3	Data Commn. & Comp. Networking(E2)	ET-18613	4	xx	2	6	3	100	40	xx	xx	50	20	25	10	175
4	Digital Communication	ET-18614	4	xx	2	6	3	100	40	50	20	xx	xx	25	10	175
5	Mechatronics(E3)	ET-18619	4	xx	2	6	3	100	40	50	20	xx	xx	25	10	175
6	Project II	ET-18616	xx	xx	4	4	xx	xx	xx	xx	xx	50	20	50	20	100
7	Advanced Power Electronics (E3)	ET-18617	4	xx	2	6	3	100	40	50	20	xx	xx	25	10	175
8	Scilab	ET-18618	xx	xx	2	2	xx	xx	xx	xx	xx	xx	xx	50	20	50
9	Industrial Management and Quality Control (IMQC)	ET-18620	3	xx	xx	3	3	100	40	xx	xx	xx	xx	xx	xx	100
10	Technical Writing	ET-18621	xx	xx	2	2	xx	xx	xx	xx	xx	xx	xx	50	20	50
	TOTAL		18	1	16	35		500		150		100		250		1000

Total Number of Credits, Student Contact Hours = 35 — **Total Marks = 1000**

Abbreviations:

1)	TH	Theory
2)	TU	Tutorial
3)	PR	Practical
4)		No Theory Exam
5)	E2, E3	Elective Two and Three

Note:

1) For progressive and continuous assessment two periodic tests of 20 marks each are for all the theory subjects. The average of these is added to the final theory examination marks, which is of 80 marks (except for online examinations).
2) All term work marks are Internal.
3) All practical exams/ oral are External and Internal.

Prepared by Mr.Anil Gurav

NOTE:

Theory credits decrease from 4 to 3, New Subject only Practicals – Scilab - ET-11618 introduced & Mobile Commn- ET-11611 – Tutorial introduced – from January 2015

For Digital Signal Processing- Practical Exam introduced (instead of oral exam) from December 2015/ January 2016

Revised in the academic year 2017-2018

Mechatronics, IMQC and Technical Writing – three new approved subjects

* **Mobile Communication in Semester 6**, to be offered as an **Elective (E2)**, against the course titled **Data Communication and Computer Networking (E2).**
* **Advanced Power Electronics in Semester 6** to be offered as an **Elective (E3)** against the new course titled **Mechatronics (E3)**.

All course codes changed from 115……series to 155…..series from the academic year 2017-2018.

PROGRAMME TITLE:Diploma in Electronics & Telecom. Engineering
SEMESTER : Six

Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 15611	MOBILE COMMUNICATION **(E2)**		**4**	**2**	6	80	20	-	-	-	100

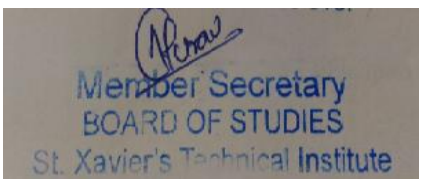
1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.

RATIONALE:

The glorious 21st century marks the growth of the mobile radio communication industry by orders of magnitude. The recent exponential growth in cellular mobile communication needs more skilled technicians for operation, maintenance and servicing of mobile cellular systems. This subject is classified under Applied 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 systems such as GSM, IS – 95 standards, WLL, call processing & basics of mobile communication systems.

COURSE OUTCOMES & CO PO MAPPING

SEM VI C 309	MOBILE COMMUNICATION (9 TH COURSE IN THIRD YEAR)
C309.1	Interpret the concept of wired & wireless technology
C309.2	Analyze the construction and working of AMPS
C309.3	Appraise the cellular concept and mobile unit
C309.4	Elaborate the concept of GSM phones
C309.5	Employ the concept of CDMA phones
C309.6	Analyze the concept of transmission of data (i.e. voicetext, videotext, file, images) using multiple access techniques i.e TDMA, CDMA,FDMA



Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM VI C 309	MOBILE COMMUNICATION (9 TH COURSE IN THIRD YEAR)PREPARED BY : RS									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C309.1				1				2		3
C309.2	1			1		2		2		3
C309.3	3	2		1		1		1		2
C309.4	1		1	2		2		1		3
C309.5	1		1	2		2		1		3
C309.6	1			2				1		3
C 309 TOTAL	07	02	02	09	00	07	00	08	00	17
CORRELATION LEVEL	1	0	0	2	0	1	0	1	0	3

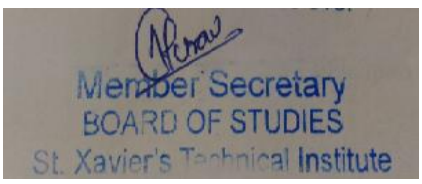
TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	06	12	18
CORRELATION LEVEL	1	2	3

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

Mr. RakeshSaroj

Subject Expert



SECTION 1			
Sr. No.	Name of the Topic	Periods	Marks
01	**Introduction to wireless communication System** **C309.1 C309.2** 1.1 Evolution of mobile radio communication 1.2 Mobile radio system around the world. (Such as AMPS, N- AMPS, IS-95, GSM) 1.3 Related definition base station, control channel, forward channel etc. Examples of wireless communication system such as paging system, cordless telephone system, cellular telephone system , how cellular telephone call is made	06	08
02	**Mobile unit C309.3** 2.1 Block Diagram and operation of mobile unit 2.2 Block Diagram & Explanation of frequency synthesizer 2.3 Block diagram and operation of transmitter, receiver, logic unit, control unit & handset	10	12
03	**The cellular concept**. **C309.3** 3.1 Introduction a basic cellular system. 3.2 Frequency reuse 3.3 Hand off, Type of hand off, hard hand off, soft hand off , delayed and queued hand off 3.4 Interference & system capacity. 3.4.1 Co channel interference & system capacity. 3.4.2 Channel planning for wireless system. 3.4.3 Adjacent channel Interference. 3.4.4 Power control for reducing interference (Closed loop, Open loop) 3.5 Improving coverage and capacity in cellular system. 3.5.1 Cell splitting. 3.5.2 Sectoring. 3.5.3 Repeater for range extension. 3.5.4 Micro cell zone concept.	16	20

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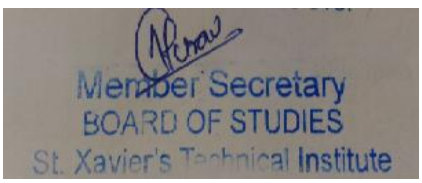
SECTION 2			
04	**Digital cellular mobile systems**. **C309.4** 4.1 G.S.M system architecture. 4.1.1 G.S.M services & features. Frequency Spectrum. 4.1.2 G.S.M radio subsystems. 4.1.3 G.S.M channel types. 4.1.4 Message & call processing in GSM 4.1.5 Privacy & security in GSM. 4.2 Signal System no.7 (SS7)—performance services.	14	16
05	**CDMA C309.5** 5.1 CDMA digital cellular standard IS-95. 5.1.1 IS.95 frequency & channel specification 5.1.2 IS-95 system architecture. Frequency Spectrum. 5.1.3 IS-95 CDMA calls Processing. 5.1.4 Security & identification in IS-95 5.1.5 Features of IS-95.	10	14
06	**Modern wireless communication system C309.6** 5.1 3GW-CDMA (UMTS) (Universal mobile Telecommunication system.) 5.2 3G CDMA 2000 5.3 3G- TD-SCDMA (synchronous) 5.4 Wireless local loop & LMDS (local multipoint distribution) 5.5 IMT 2000 5.6 Comparison of 3G systems.	08	10



SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1	Introduction to wireless communication System	06	04	04	---	08
2	Mobile unit	10	04	06	04	12
3	The cellular concept	16	06	08	06	20
Section II						
4	Digital cellular mobile systems	14	04	06	06	16
5	CDMA	10	04	04	06	14
6	Modern wireless communication system	08	--	06	04	10
Total		64	14	24	42	80

IMPLEMENTATION STRATEGY

1. Teaching plan
2. Other resources like data projector, video presentations, PowerPoint presentations.

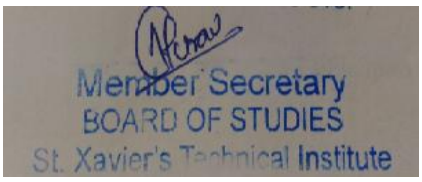
This subject has only theory lectures and theory examination (including periodical tests). There is no practical/ oral examination and no term work marks for this.

E- REFERENCES :

https://mrcet.com › digital_notes ›
https://lecturenotes.in › ... › Mobile Communication
https://www.researchgate.net

REFERENCES :

Sr. No.	Author	Title	Publisher & Address
1.	T.S.Rappaport	Wireless Communication Principles & Practices	Pearson Education
2.	William Lee	Mobile Cellular Tele Communication	TataMc Graw Hill
3	Ashoke Talukder Roopa Yavagal	Mobile Computing	TataMc Graw Hill



PROGRAMME TITLE: Diploma in Electronics & Telecom Engineering
SEMESTER : Six

Course Code	Course Title	Prerequisite	Credits				Examination Scheme					
			L	T u	P	Total	Theory TH	Theory TS	PR	OR	TW	Total
ET 15612	DIGITAL SIGNAL PROCESSING		3	1	2	6	80	20	**50**	-	25	175

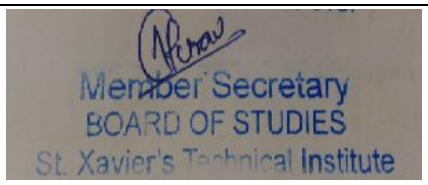
1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of **PRACTICAL EXAM** is Internal and External.
4) The assessment of Term-Work is Internal

RATIONALE:

Digital Signal Processing continues to play an increasingly important role in the fields that range literally from A (Astronomy) to Z (Zeugmatography, or magnetic resonance imaging) and encompasses applications in areas such as Compact Disc Players, Speech Recognition, echo cancellation in communication systems, image enhancement, geophysical exploration, noninvasive medical imaging, etc. This subject belonging to the Applied Technology groupaims to build concepts related to the fundamental principles and applications of Signals, System Transforms and Filters.

COURSE OUTCOMES & CO PO MAPPING

SEM VI C 310	DIGITAL SIGNAL PROCESSING (10 TH COURSE IN THIRD YEAR)
C310.1	Illustrate IIR & FIR Filters in Direct , Cascade and Parallel structure form.
C310.2	Analyse signals using Discrete Time Fourier Transform & Discrete Time Fourier Series.
C310.3	Evaluate Linear convolution & Circular convolution using DFT/IDFT method.
C310.4	Apply DIT & DIF Algorithms to solve DFT.
C310.5	Solve IDFT by using Inverse DIT & Inverse DIF Algorithms.
C310.6	Calculate 4 point & 8 point DFT / IDFT using Twiddle factor method.



Mapping of Course outcomes (COs) to Program outcomes (POs)

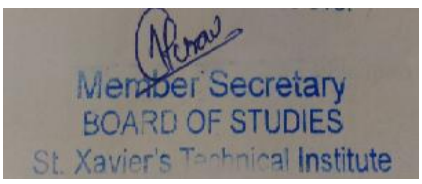
SEM VI C 310	DIGITAL SIGNAL PROCESSING (10 TH COURSE IN THIRD YEAR)PREPARED BY : KHK									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C310.1	3	3	3	3	2			3	1	2
C310.2	3	3	3	3	2			3	1	1
C310.3	3	3	3	3	2			2	1	1
C310.4	3	3	3	3	2			3	1	2
C310.5	3	3	3	3	2			3	1	2
C310.6	3	2	2	2	1			2	1	1
C 310 TOTAL	18	17	17	17	11	00	00	16	06	09
CORRELATION LEVEL	3	3	3	3	2	0	0	3	1	2

TABLE TO DECIDE CORRELATION LEVELS

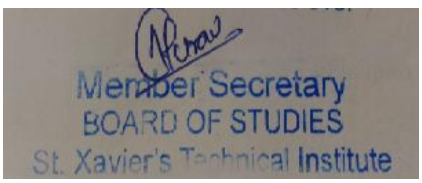
CO SUM TOTAL	06	12	18
CORRELATION LEVEL	1	2	3

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

Mr. K. H. Kamath
Subject Expert



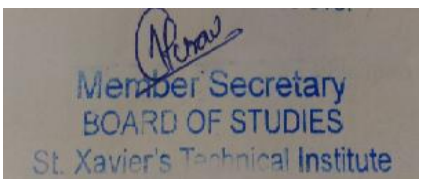
Sr. No.	Name of the Topic	Periods	Marks
	SECTION 1		
01	**Discrete Time Signals & SystemsC310.2** 1.1 Concept of Linear Convolution and Correlation 1.2 Computation of Convolution and Correlation 1.3 Finite Impulse Response (FIR) and infinite Impulse Response (IIR) Systems 1.4 Discrete Time Fourier Series (DTFS) 1.5 Discrete Time Fourier Transform (DTFT) 1.6 Fourier Transform of Standard Signals(DTFT) 1.8 Properties of Fourier Transform for Discrete Time Signals(proof of properties not expected) 1.9 Problems on DTFT	12	20
02	**Time Domain Analysis of DT SystemsC310.1** 2.1 System Transfer Function 2.2 Structures for FIR system Direct form Realization of FIR system Cascade form Realization of FIR system 2.3 Structures for IIR Systems Direct form I and II Realization of IIR system Cascade form Realization of IIR system Parallel form Realization of IIR system 2.4 Problems on above topics	12	20
	SECTION 2		
03	**Discrete Fourier Transform (DFT)C310.3 C310.6** 3.1 Introduction 3.2 Definition of DFT and IDFT 3.3 DFT of Standard signals 3.4 Twiddle Factor for 4 - point and 8 – point DFT 3.5 Cyclic property of Twiddle Factor 3.6 Problems on 4 - point and 8 – point DFT & IDFT 3.6. DFT Properties (proof of properties not expected) 3.7 Circular convolution - Graphical method Matrix method DFT – IDFT method 3.8 Linear convolution using DFT	16	24



04	**Fast Fourier TransformC310.4 C310.5 C310.6** 4.1 Introduction 4.2 Radix-2 FFT Algorithm (no derivation is expected) 4.3 Radix-2 Decimation in Time (DIT) FFT Algorithm 4.4 Radix-2 Decimation in Frequency (DIF) FFT Algorithm 4.5 Total Signal Flow Graph(Butter Fly diagram) for 4 point and 8 point DIT FFT 4.6 Total Signal Flow Graph for 4 point and 8 point DIF FFT 4.7 Computation of Inverse DFT (IDFT) Using FFT Algorithms	08	16

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME
1	**Compute Linear Convolution and Correlation**	**C310.1**
2	**Compute impulse response of the given transfer function**	**C310.1**
3	**Compute impulse response of the given difference equation**	**C310.1**
4	**Determination of Cascade realization of filter**	**C310.1**
5	**Determination of Parallel realization of filter**	**C310.1**
6	**Compute DTFT and plot real and imaginary parts of DTFT**	**C310.2**
7	**Compute and plot magnitude and phase spectrum of DTFT**	**C310.2**
8	**Compute N point DFT of unit step sequences**	**C310.4**
9	**Compute N point DFT of any given sequences**	**C310.4**
10	**Compute N point IDFT of any given sequences**	**C310.5**
11	**Compute Linear Convolution using DFT**	**C310.3**
12	**Compute Linear Convolution using Circular Convolution**	**C310.3**
13	**Illustration of De-convolution**	**C310.6**
14	**Illustration of circular shift property of DFT**	**C310.6**
15	**Illustration of complex conjugate property of DFT**	**C310.6**



SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

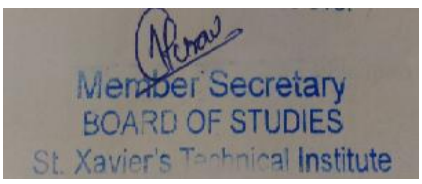
Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1	Discrete Time Signals & Systems	12	02	06	12	20
2	Time Domain Analysis of Discrete Time Systems	12	02	06	12	20
Section II						
3	Discrete Fourier Transform	16	04	08	12	24
4	Fast Fourier Transform	08	02	06	08	16
Total		48	10	26	44	80

The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:

(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C310.1 (out of 25)	C310.1 (out of 25)	C310.1 (out of 25)	C310.1 (out of 25)	C310.1 (out of 25)	C310.2 (out of 25)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
…….							
…….							

* The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.



The table to measure the attainment levels for PRACTICAL EXAMINATION (on a rating scale of "out of 50') of the defined expected course outcomes is as shown in the format given below:

(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C310.1 (out of 50)	C310.1 (out of 50)	C310.1 (out of 50)	C310.1 (out of 50)	C310.1 (out of 50)	C310.2 (out of 50)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
…….							

* The final % attainment level for PRACTICAL EXAMINATION of each course outcome may then be computed and the overall % attainment level for the course, for practicalexam may then be calculated.

REFERENCES

S. No.	Author	Title	Edition	Publisher & Address
1	J.G. Proakis	Introduction to Digital Signal Processing	1st	PHI 2
2	Oppenhiem and Schaffer	Discrete Time Signal Processing	3rd	John Wiley
3	S.K. Mitra	Digital Signal Processing	5th	TMH
4	N.G. Palan	Digital Signal Processing	1st	Technova
5	R.A. Barapatre J.S. Katre	Discrete Time Signal Processing	2nd	Techmax

E-REFERENCES

https://www.coursera.org/learn/dsp1

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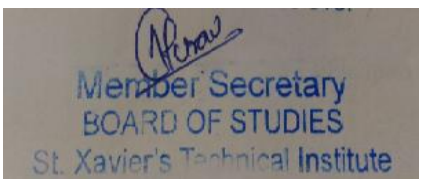
https://101science.com/dsp.htm



PROGRAMME TITLE:Diploma in Electronics &Telecom. Engineering
SEMESTER : Six

Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 15613	DATA COMMUNICATION AND COMPUTER NETWORKING **(E2)**	ET-15413	4	2	6	80	20	-	50	25	175

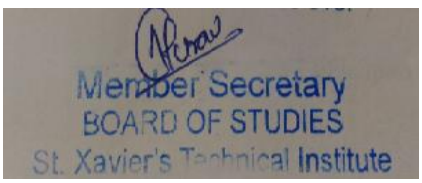
1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of oral is Internal and External.
4) The assessment of Term-Work is Internal.

RATIONALE:

This subject is categorized under Applied Technology. After understanding basic communication systems, it is important to proceed further on to the concepts related to Data Communication and Computer Networking. The field of communication is the fastest growing technology and undoubtedly heading towards to a runaway growth in future which makes it important to know how data transfer takes place from one system to another, through different channels and computer networks like LAN, MAN, WAN & the Internet. Protocols and standards along with different switching techniques are some other important issues which are covered in this subject.

COURSE OUTCOMES & CO PO MAPPING

SEM VI C 311	DATA COMMUNICATION AND COMPUTER NETWORKING (11 TH COURSE IN THIRD YEAR)
C311.1	Classify networks and design application based network architecture
C311.2	Calculate the performance parameters of given network
C311.3	Classify topologies and demonstrate the suitable networking devices for sharing the resources
C311.4	Organize the protocols used in OSI model
C311.5	Compare the TCP-IP model and OSI model
C311.6	Estimate different methods of error detection and error correction



Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM VI C 311	DATA COMMUNICATION AND COMPUTER NETWORKING (11 TH COURSE IN THIRD YEAR)PREPARED BY : MM									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C311.1		3	3	3	2	2	3	3	2	3
C311.2	3	2	1	1	3	2	2	2	1	2
C311.3	1	3	3	3	3	2	2	3	2	3
C311.4		1							2	2
C311.5	1	3	3	3	1	1	2	2	2	2
C311.6	3	2	1		3	2	2	1	2	2
C 311 TOTAL	08	14	11	10	12	09	11	11	11	14
CORRELATION LEVEL	1	2	2	2	2	2	2	2	2	2

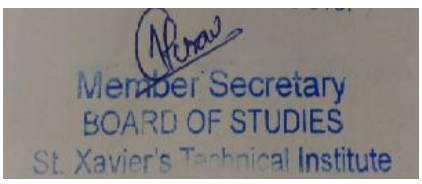
TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	06	12	18
CORRELATION LEVEL	1	2	3

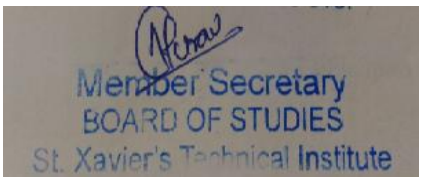
CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

Mr. Mahesh Munde

Subject Expert



Sr. No.	Name of the Topic	Periods	Marks
	SECTION 1		
1	**Basic Network ConceptsC311.1** 1.1 Understanding Network - Human Networks; Computer Networks; Network Plan. 1.2 Network architecture – LAN topology, sharing of resources, managing users & maintaining n/w, –adhoc and infrastructure . 1.3 Distinguishing Between Network classifications Classifying Networks by their Geography – LAN, MAN, WAN	09	12
2	**Concept of Data Communication & Networking C311.2** 2.1 Data Communication – Protocols; Standards - De-facto &de-jurie Standards Organizations (ITU-T, ANSI-) 2.2 Signal Propagation - Analog & Digital Signals; Bandwidth of signal & a medium; Data transmission rate and bandwidth.	09	12
3	**Network Topologies and Networking DevicesC311.3** 3.1 Types of Topology – Concept; Advantages; Disadvantages; Bus , Ring ,Star , Mesh ,Tree , Hybrid Topology; Comparative study of Topologies. Types of Cables 3.2 Network Connectivity devices – Network interface card (NIC), Modems, Repeaters, Hubs, Bridges, switches, Router. 3.3 Connectionless services & connection oriented services; Circuit Switching & Packet Switching	14	16
	SECTION 2		
4	**OSI Reference ModelC311.4** 4.1 Need, definition 4.2 Seven Layers of OSI Model: Physical layer; Data link layer; Network layer; Transport layer; Session layer; Presentation layer; Application layer.	09	12
5	**TCP/IP Reference ModelC311.5** 5.1 Link; Internet; Transport; Application layer. 5.2 Comparison of the OSI and TCP/IP reference models. 5.3 TCP/IP Protocols – Introduction to TCP/IP Layers	09	12
6	**Transmission Errors-Detection & Correction C311.6** 6.1 Error classification – Delay distortion, Attenuation Noise; Types of Errors; 6.2 Error detection -Vertical redundancy check; longitudinal redundancy check; Cyclic redundancy check; 6.3 Error Correction Code: Hamming Code	14	16



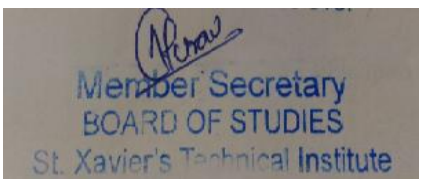
LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	To prepare straight and cross-over cable using RJ45 connector	C311.2
2	Installation of Client OS WINDOWS 7	C311.2
3	Installation of Client OS LINUX	C311.2
4	Installation and configuration of WINDOWS 2003 SERVER	C311.2
5	Installation and configuration of LINUX SERVER	C311.2
6	Sharing Resources and Share Level Security	C311.5
7	Make a small LAN – with 4 computers	C311.2
8	Installation of SWITCH and ROUTER	C311.2
9	Configuring protocols on Manageable SWITCH	C311.5
10	Configuring protocols on ROUTER	C311.5

Note: Lab Experience Numbers 2- 10 are conducted using simulator.

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1	Basic Network Concepts	09	04	06	02	12
2	Concept of Data Communication & Networking	09	02	04	06	12
3	Network Topologies and Networking Devices)	14	02	04	10	16
Section II						
4	OSI Reference Model	09	04	04	04	12
5	TCP/IP Reference Model	09	04	04	04	12
6	Transmission Errors- Detection & Correction	14	02	04	10	16
Total		64	18	26	36	80



The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C311.2 (out of 25)	C311.2 (out of 25)	C311.2 (out of 25)	C311.2 (out of 25)	C311.2 (out of 25)	C311.5 (out of 25)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							

* The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

The table to measure the attainment levels for PRACTICAL EXAMINATION (on a rating scale of "out of 50') of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C311.2 (out of 50)	C311.2 (out of 50)	C311.2 (out of 50)	C311.2 (out of 50)	C311.2 (out of 50)	C311.5 (out of 50)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
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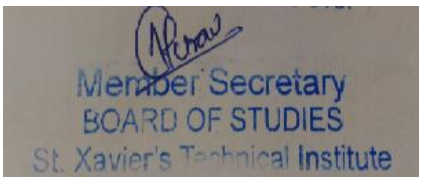
* The final % attainment level for PRACTICAL EXAMINATION of each course outcome may then be computed and the overall % attainment level for the course, for practical exam may then be calculated.



IMPLEMENTATION STRATEGY:

1.Teaching plan
2.Minimum 10 practicals.

REFERENCES:

S. No.	Author	Title	Publisher & Address
1	Achyut S. Godbole	Data Communication & Networking	Tata McGraw-Hill
2	B.A. Forouzan	Data Communication & Networking	Tata McGraw-Hill Edition (4th Edition)
3	Michal Miller	Data & Network Communication	Thomson Delmar Learning
4	AndrewTannenbaum	Computer Networks	Mc-Graw Hill International; New York
5	Comer & Stevens	TCP/IP (Vol. 1)	Mc-Graw Hill International; New York
6	William Stallings	Computer Networks	Mc-Graw Hill

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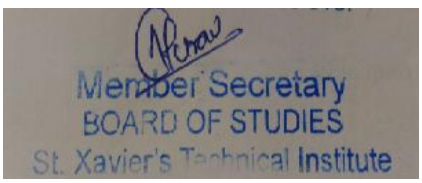


PROGRAMME TITLE:Diploma in Electronics & Telecom. Engineering
SEMESTER : Six

Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 15614	DIGITAL COMMUNICATION	ET15413 ET15312	**4**	**2**	6	80	20	50	-	25	175

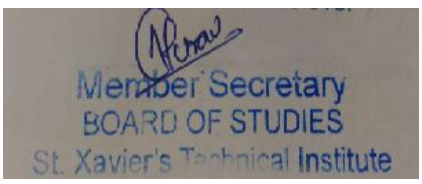
1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of practical is Internal and External.
4) The assessment of Term-Work is Internal.

RATIONALE:

This subject comes under the AppliedTechnology category. Presently, majority of the telecommunication systems operate on the basis of digital principles. It demands that the student has a good working knowledge of fundamentals of pulse and data communication. The subject will help the student in understanding the concepts of various pulse modulation techniques and methods of generating and demodulating, in each of the pulse modulation systems and digital carrier modulation systems.

COURSE OUTCOMES & CO PO MAPPING

SEM VI C312	DIGITAL COMMUNICATION (12TH COURSE IN THIRD YEAR)
C312.1	Calculate the performance parameters of Digital Communication System using the concepts of Information theory
C312.2	Encode the analog information using analog pulse modulation techniques.
C312.3	Convert analog signal into digital using different digital pulse modulation systems.
C312.4	Categorize the various multiplexing techniques in modern digital communications.
C312.5	Selectappropriate digital modulation technique as per the system requirement.
C312.6	Recover the original information through suitable digital demodulation technique.



Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM VI C312	DIGITAL COMMUNICATION (12TH COURSE IN THIRD YEAR)PREPARED BY : JN									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C312.1	3			1	1				1	2
C312.2	1	3	3	2			2	3	2	3
C312.3	1	3	3	2			2	3	2	3
C312.4	1	3	3	2	1		2	3	2	3
C312.5	1	3	3	2			2	3	2	3
C312.6	1	3	3	2			2	3	2	3
C 312 TOTAL	08	15	15	11	02	00	10	15	11	17
CORRELATION LEVEL	1	3	3	2	0	0	2	3	2	3

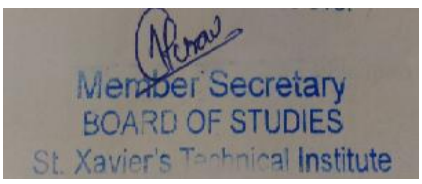
TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	06	12	18
CORRELATION LEVEL	1	2	3

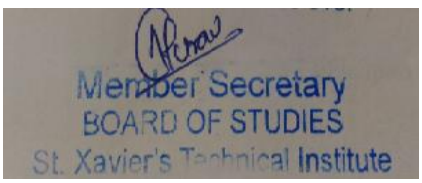
CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

Mrs. Janani Natarajan

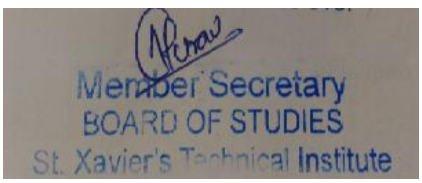
Subject Expert



SECTION 1			
Sr. No.	Name of the Topic	Periods	Marks
01	**INFORMATION THEORY:C312.1** 1.1 Introduction. Block diagram of basic digital communication system. 1.2 Measure of information Amount of information Average information Information rate Channel capacity – Definition and Expression 1.3 Hartley's laws related to channel capacity 1.4 Shannon & Hartley theorem 1.5 Problems on above topics 1.6 Channel noise and its effect 1.7 Multilevel systems 1.7.1 Comparison with binary coding system ,Communication efficiency	14	16
02	**PULSE COMMUNICATIONS:C312.2 C312.3** 2.1 Pulse modulation 2.1.1 Comparison with CW modulation 2.1.2 Advantages 2.1.3 Classification of Pulse modulation 2.1.4 Sampling theorem and its importance 2.2 Analog Pulse modulations: PAM, PWM & PPM 2.2.1 Pulse Amplitude modulation (PAM) – Definition, Waveforms 2.2.2 Types - Single and Double Polarity type, Flat top and naturalPAM 2.2.3 Generation of PAM 2.2.4 Pulse Width modulation (PWM) - Definition,waveforms, Description 2.2.5 Symmetrical PWM, leading edge and trailing edgePWM 2.2.6 Generation of PWM 2.2.7 Pulse Position Modulation (PPM) Definition,waveforms, description 2.2.8 Generation of PPM from PWM; Block diagram of PPMtransmitter 2.2.9 Relative advantages and disadvantages of PAM,PWM & PPM systems 2.3 Digital Pulse Modulation 2.3.1 Pulse Code Modulation (PCM) – Definition, Waveforms 2.3.2 Principles of PCM 2.3.3 Quantization of signal for PCMand Quantization error 2.3.4 Block diagram of 5 channel and 10 channel PCM transmitter 2.3.5 Companding 2.3.6 Demodulation of PCM 2.3.7 Block diagram of PCM receiver 2.3.8 Delta Modulation - working principle	18	24

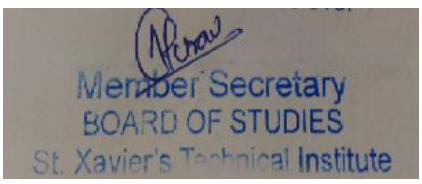


SECTION 2			
03	**CHANNEL MULTIPLEXING: C312.4** 3.1 Time Division Multiplexing (TDM), Definition Block diagram of a typical TDM system, Waveforms 3.2 Frequency Division Multiplexing (FDM) 3.2.1 Definition ,Group formation 3.2.2 Pre group, Basic group formation 3.2.3 Block diagram of 12 channel Basic group 3.2.4 Super group Block diagram of Super group 3.2.5 Master group, Super Master group 3.2.6 Standard frequency allocations and bandwidth considerations in each of these groups ,Pilot carrier frequencies 3.2.7 General block diagram of FDM Transmitter & Receiver 3.2.8 Comparison - relative performances of TDM & FDM systems.	14	16
04	**BINARY MODULATION TECHNIQUES: C312.5 C312.6** **4.1 Digital CW modulation techniques** **4.1.1 AMPLITUDE SHIFT KEYING (ASK) :** 4.1.1.1 Definition, description, waveforms. 4.1.1.2 ASK modulator 4.1.1.3 ASK receiver 4.1.1.4 Advantages, disadvantages and applications **4.1.2 FREQUENCY SHIFT KEYING (FSK) :** 4.1.2.1 Definition, description, waveforms 4.1.2.2 FSK modulator using Timer IC 555 4.1.2.3 FSK receiver (PLL type), 4.1.2.4 Advantages, disadvantages and applications **4.1.3PHASE-SHIFT KEYING (PSK):** 4.1.3.1 Definition, description, waveforms of BPSK signal 4.1.3.2 BPSK transmitter - Circuit diagram study using Ring modulator 4.1.3.3 BPSK receiver 4.1.3.4 QPSK- definition, waveforms, constellation diagram 4.1.3.5 QPSK - transmitter and receiver systems 4.1.3.6 QAM – definition, constellation diagram, types 4.1.3.7 QAM transmitter	18	24



LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	Pulse Amplitude Modulation using OPAMPS (ADTRON KIT)	C312.2
2	Pulse Amplitude Modulation using Transistor Circuit	C312.2
3	Pulse Width Modulation using OPAMPS (ADTRON KIT)	C312.2
4	Pulse Width Modulation using single OPAMP	C312.2
5	Pulse Position Modulation using ADTRON KIT	C312.2
6	Pulse Position Modulation using OPAMP	C312.2
7	Frequency Shift Keyed Modulation using ADTRON KIT	C312.5
8	Pulse Code Modulation using ADTRON KIT	C312.3
9	Time Division Multiplexing using TDM KIT	C312.4
10	Time Division De-Multiplexing using TDM KIT	C312.4
11	Pulse Code Demodulation using ADTRON KIT	C312.3
12	Frequency Shift Keyed Demodulation using PLL Circuit	C312.6
13	ASK Modulation/ Demodulation using Anshuman CM6 Kit	C312.6
14	Frequency Division Multiplexing (FDM) using Anshuman CM6 and P19 Kits	C312.4
15	Quadrature Amplitude Modulation (QAM) using Anshuman CM6 Kit	C312.5



SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

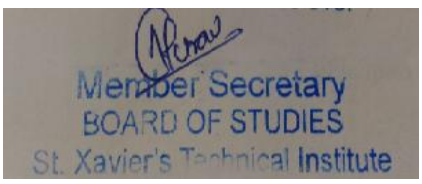
Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1	INFORMATION THEORY	18	04	06	06	16
2	PULSE COMMUNICATIONS	14	08	12	04	24
Section II						
4	CHANNEL MULTIPLEXING	14	04	06	06	16
5	BINARY MODULATION TECHNIQUES	18	08	12	04	24
Total		64	24	36	20	80

The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C312.2 (out of 25)	C312.2 (out of 25)	C312.2 (out of 25)	C312.2 (out of 25)	C312.2 (out of 25)	C312.2 (out of 25)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
…….							

* The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

The table to measure the attainment levels for PRACTICAL EXAMINATION (on a rating scale of "out of 50') of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)



LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C312.2 (out of 50)	C312.2 (out of 50)	C312.2 (out of 50)	C312.2 (out of 50)	C312.2 (out of 50)	C312.2 (out of 50)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							

* The final % attainment level for PRACTICAL EXAMINATION of each course outcome may then be computed and the overall % attainment level for the course, for practical exam may then be calculated.

IMPLEMENTATION STRATEGY

1.Teaching plan

2.Minimum 10 practicals

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	George Kennedy	Electronic Communication Systems	4th	1999	Tata McGraw-Hill New Delhi.
2.	Roddy Coolen	Electronic Communication	3rd	2000	Prentice Hall of India, New Delhi
3.	Taub Schilling	Principles of communication Systems	3rd	1986	McGraw-Hill International, New York
4.	Robert J. Schoenbeck	Electronic Communications - Modulation and Transmission	2nd Edition	1999	Prentice Hall of India
5.	K. Sam Shanmugam	Digital and Analog Communication Systems	1st	2012	Wiley India

E- REFERENCES :

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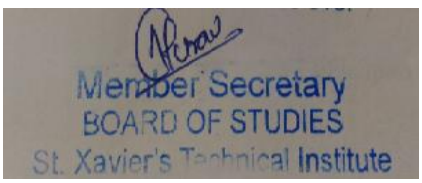


PROGRAMME TITLE : Diploma in Electronics & Telecom. Engineering ***SEMESTER :*** Six											
Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 15619	Mechatronics **(E3)**		**4**	2	6	80	20	50	-	25	175

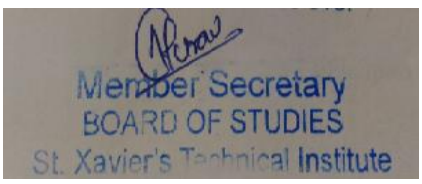
1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of Practical's is Internal and External.
4) The assessment of Term-Work is Internal.

RATIONALE:

The mechatronics course is an advanced course in the electronics and telecommunication branch. This subject will help student to understand the complex interfacing between the mechanical and electrical systems. This subject mainly focus on the electrically excited mechanical systems like actuators, sensors, MEMS, Controller , robot. Mechatronics forms a base for robotic engineering.

COURSE OUTCOMES & CO PO MAPPING

SEM VI C 313	**Mechatronics ELECTIVE III (13 TH COURSE IN THIRD YEAR)**
C 313.1	**Identify the elements of Mechatronics.**
C 313.2	**Illustrate the functions and working of Sensors and Transducers in Mechatronics .**
C 313.3	**Demonstrate the controlling of PLC,CNC and microcontrollers inMechatronics**
C 313.4	**Explain various mechanical and electrical actuating systems.**
C 313.5	**Draw and identify the basic elements of Robotics and micro electro mechanical systems.**
C 313.6	**Apply the fundamentals of Mechatronics for automation of the system.**



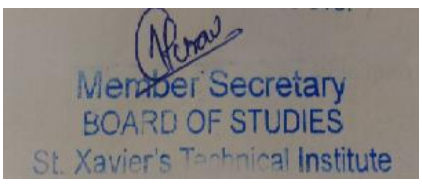
Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM VI C 313	Mechatronics ELECTIVE III (13 TH COURSE IN THIRD YEAR) BY VN									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C 313.1	1	1	0	0	0	1	0	0	0	1
C 313.2	1	3	3	2	1	1	0	0	0	1
C 313.3	2	3	3	3	0	3	0	2	2	1
C 313.4	2	2	2	2	0	1	0	1	2	2
C 313.5	1	3	1	2	0	2	0	1	1	2
C 313.6	3	3	3	1	1	3	1	3	2	3
C 313 TOTAL	10	15	12	10	2	11	1	7	7	10
CORRELATION LEVEL	2	2	2	2	1	2	1	1	1	2

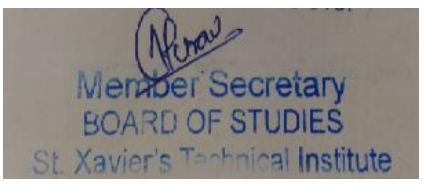
TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	3-8	9-14	15-18
CORRELATION LEVEL	1	2	3

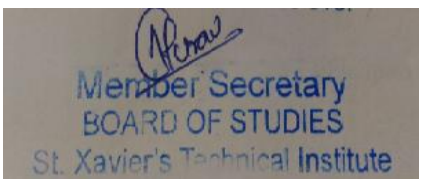
Subject Expert
Mr.Vinay Nagalikar



SECTION 1			
Sr. No.	Name of the Topic	Periods	Marks
01	**Elements of Mechatronic System (C313.1)** 1.1 Importance of mechatronics in various fields of engineering, 1.2 Evolution of mechatronis**,** Block diagram of mechatronic systems and identification of elements **(**Sensors, signal conditioners, controllers, Actuators),	06	08
02	**Sensors and Transducers (C313.2)** 2.1 **Proximity and position Sensors:**Photo electric sensors, Inductive sensor, Capacitive sensor(Construction, principle of operation and application) 2.2**Velocity, Motion, Acceleration, Force and Torque Sensors(construction, principle of operation and application)** **Velocity Sensors**: Electromagnetic transducers, Tacho generators. **Motion Sensors:** Stroboscope , Pyroelectric Sensors **Acceleration sensors:** Strain gauge accelerometer, Piezo electricaccelerometer,LVDT accelerometer. **Torque sensors :** Torque measurement using strain gauge, torquemeasurement using torsion bar (optical method, capacitive method, proximity sensor method, stroboscope method)	13	16
03	**Controllers in Mechatronic Systems(C.313.3)** 3.1Characteristics and implementation of P,PI,PD,PID. 3.2Block diagram of Fuzzy logic controllers , function of each block, application of fuzzy logic control in fully automatic washing machine (only block diagram) 3.3Review of PLC architecture and ladder logic programming (simple programs), 3.4General configuration of CNC system , advantages of CNC, part programming of CNC machines, G codes and M codes, Small application programs.	13	16



SECTION 2			
04	**Actuating Elements (C313.4)** 4.1 **Hydraulic systems, pneumatic systems and actuators:** Hydraulic systems: Physical components of hydraulic systems: Hydraulic pumps, filters and pressure regulation Pneumatic systems: Air compressors, filters and regulators. 4.2 **Electric actuators:** Stepper motor, DC motor, Solenoid valves, Relays (Principle of operation and application 4.3 **Mechanical Actuating Systems:** Cams, Gear, Belt , Rack and Pinion and Bearings (Principle of operation, types, and application) 4.4 Compensators Lead,Lag,Lead-lag.	13	16
05	**Robotics and Micro Electro Mechanical Systems (MEMS) (C313.5)** **5.1 Robotics:** Block diagram and function of each component (Sensors, drive system, control system, end effectors). **5.2MEMS :** Block diagram and Identify the Basic Blocks of MEMS (Micro sensors, Micro actuators, signal conditioners)**,** construction of MEMS Accelerometer, MEMS accelerometer as airbag sensors for car safety.	13	16
06	**Integration of Mechatronic Systems(C313.6)** 6.1 Block diagram, working and operation of following systems- CNC based Drilling machine, PLC based Automatic car park barrier systems, Microcontroller/PLC based Pick and place robot.	06	08

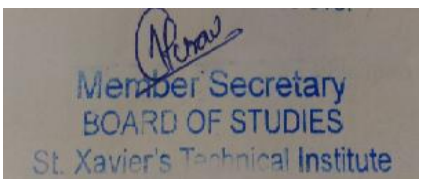


LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	Open loop & close loop response of processes under different P.	C313.3
2	Open loop & close loop response of processes under different PI.	C313.3
3	Open loop & close loop response of processes under different PID.	C313.3
4	Experiments with Lead compensators	C313.4
5	Experiments with Lag compensators	C313.4
6	Experiments with Lead-lag compensators	C313.4
7	Write and verify ladder program for ON-Off control of Lamp.	C313.2
8	Write and verify ladder program for control of conveyor belt motor.	C313.6
9	Temperature controller with PID controller.	C313.2
10	Stepper motor control using microcontroller.	C313.3
11	Characteristics of linear, equal percentage and quick opening control valve.	C313.4

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1	**Elements of Mechatronic System**	**06**	**04**	**04**	**--**	**08**
2	**Sensors and Transducers**	**13**	**04**	**08**	**04**	**16**
3	**Controllers in Mechatronic Systems**	**13**	**04**	**08**	**04**	**16**
Section II						
4	**Actuating Elements**	**13**	**04**	**08**	**04**	**16**
5	Robotics and Micro Electro Mechanical Systems (MEMS)	**13**	**04**	**08**	**04**	**16**
6	**Integration of Mechatronic Systems**	**06**	**04**	**04**	**--**	**08**
Total		**64**	**24**	**36**	**20**	**80**



The table to measure the attainment levels for PRACTICAL EXAM (on a rating scale of "out of 50") of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

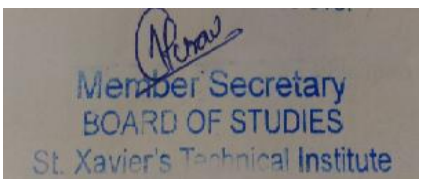
LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C313.1 (out of 50)	C313.1 (out of 50)	C313.1 (out of 50)	C313.1 (out of 50)	C313.1 (out of 50)	C313.2 (out of 50)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
…….							

* The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25") of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C313.1 (out of 25)	C313.1 (out of 25)	C313.1 (out of 25)	C313.1 (out of 25)	C313.1 (out of 25)	C313.2 (out of 25)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
…….							

* The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.



IMPLEMENTATION STRATEGY

1.Teaching plan
2.Minimum 10practicals

REFERENCES

S. No.	Author	Title	Publisher & Address
1	Farbod Khoshnoud	Mechatronics: Fundamentals and Applications	Spring Publication.
2	Jan Awrejcewicz	Mechatronics: Ideas for Industrial Applications	Spring Publication.
3	Jacob Fraden	Handbook of Modern Sensors	Spring Publication.

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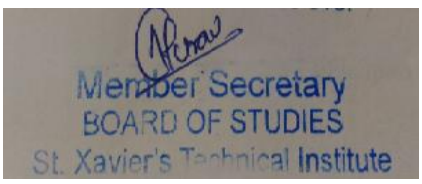


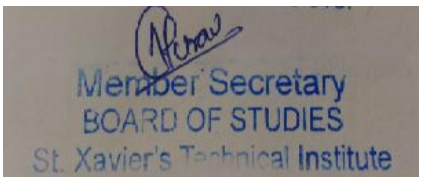
PROGRAMME TITLE: Diploma in Electronics &Telecom. Engineering ***SEMESTER :*** Six											
Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory					
			L	P	Total	TH	TS	PR	OR	TW	Total
ET 15616	PROJECT II **(No Theory exam)**		-	4	4	-	-	-	50	50	100
The assessment of projectoral is Internal and External. The assessment of term work is Internal.											

RATIONALE:

Project is classified under Applied Technology courses. In continuation to the Project work started by the student in the fifth semester, he/she has to meet the set goals of testing, finalization and completion before the end of the sixth semester. Project work is supposed to be largely a student centered activity. It is a purposeful student activity which is supposed to be planned, designed and performed by a student or a group of students, which ultimately will help them to accomplish higher level cognitive and affective domain activities. It will also help them to achieve psychomotor objectives. The objective of the project work undertaken is to reinforce and integrate previously acquired lower sub-skills and attitudes within a branch and slowly transform them into higher level skills. It will help to develop competencies and confidence to solve open and real life interdisciplinary problems. Project work is supposed to develop thinking, planning and decision making skills with ample scope for using creativity. It presents a challenging and task oriented learning environment with optional solutions, besides developing ability and confidence in accomplishing targets with given time and resources constraints. It is also meant to develop higher level interactive skills and ability of working in teams.

COURSE OUTCOMES & CO PO MAPPING

SEM VI C 314	**PROJECT II (14 TH COURSE IN THIRD YEAR)**
C314.1	**Reinforce and integrate previously acquired lower sub-skills and attitudes within a branch and slowly transform them into higher level skills**
C314.2	**Develop competencies and confidence to solve open and real life interdisciplinary problems.**
C314.3	**Develop thinking, planning and decision making skills with ample scope for using creativity.**
C314.4	**Present a challenging and task oriented learning environment with optional solutions**
C314.5	**Develop confidence in accomplishing targets with given time and resources constraints and work as a team**



Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM VI C 314	PROJECT II (14 TH COURSE IN THIRD YEAR)									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C314.1		3		3	2		2	3	3	
C314.2		3		3	2		2	3	3	
C314.3		3		3	2		2	3	3	
C314.4		3		3	2		2	3	3	
C314.5		3		3	2		2	3	3	
C 314 TOTAL	00	15	00	15	10	00	10	15	15	00
CORRELATION LEVEL	0	3	0	3	2	0	2	3	3	0

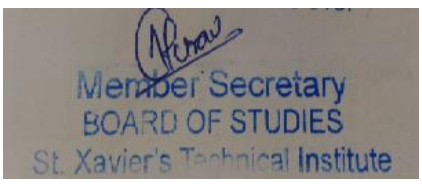
TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	06	12	18
CORRELATION LEVEL	1	2	3

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

Mrs. Janani Natarajan

Subject Expert



OBJECTIVES/ CRITERIA FOR ASSESSMENT:

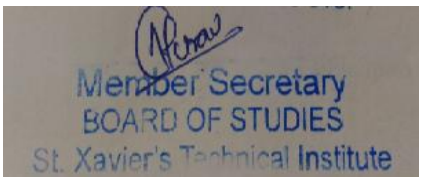
The students will be able to dothe following in relation to the **"translation"** of the expected course outcomes specified in the table above. It should be observed and evaluated by the concerned teacher whether the students do the following **during practical time**:

C314.1 - Apply and expand upon the previous knowledge gained in earlier semesters.
C314.2 - Work with confidence on PCB's, soldering/ de-soldering, testing of circuit, etc.
C314.3 - Make logical decisions pertaining to requirements of project.
C314.4 - Solve problems faced during the design and building and testing phases of project.
C314.5 - Work with confidence and in a timely manner, and work as a team together.

The course outcome attainment levels are to be evaluated on a regular basis for the **TERM WORK**, based on the student **commitment, interaction and activity, as defined in and stated abovein the corresponding objectives/ criteria, during the practical time** allotted to them for the **PROJECT WORK** for 8 sessions of 4 hours each by the concerned teacher. This is for **TERM WORK** of **50 marks**. The table represents a measure of the attainment levels (on a rating scale of "out of 50') through observation of performance of students in relation to the "translation" of the course outcomes is as listed above. Besides this ATTENDANCE is to be used as a reference - If ATTENDANCE or STUDENT INTERACTION/ INTEREST is not satisfactory (as in remarks column provided) TERM WILL NOT BE GRANTED

	OBJECTIVES/ CRITERIA	C314.1 (out of 50)	C314.2 (out of 50)	C314.3 (out of 50)	C314.4 (out of 50)	C314.5 (out of 50)	REMARKS	% ABSENT
STUDENT SPNO								
1303001								
1303002								
1303004								
1303005								
1303006								
1303008								
1303011								
…….								
…….								
……								
….								

* The final average % attainment level of course outcomes for the course, for term work may then be calculated.
* The course outcomes attainment levels for the **ORAL EXAMINATION** should be based on their ACTUAL PROJECT, PROJECT REPORT, PRESENTATION OF THE SAME, and RESPONSES given during the oral examination. This is for the **ORAL EXAMINATION** of **50 marks**.



CONTENTS

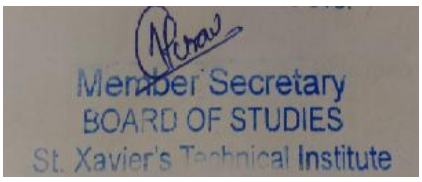
Sr. No.	Name of the Topic	Periods	Marks
1	**ANALYSIS** Electronics/Software Requirement Specification, Enhancement Model, Role of Management in Electronics/Software Development, Role of Metrics and Measurement, Problem Analysis, Requirement Specification, Validation, Metrics, Monitoring and Control.	10	
2	**DESIGN** Problem Partitioning, Abstraction, Design, specification & verification, metrics, Monitoring & Control	12	
3	**TESTING,MAINTENANCE & IMPLEMENTATION OF THE SELECTED PROJECT** Levels of Testing- Functional Testing, Structural Testing, Test Plan, Test Cases Specification, Reliability assessment. Project Management, Cost Estimation, Project Scheduling, Electronics/Hardware/Software Configuration Management, Quality Assurance, Project Monitoring, Risk Management	10	

INSTRUCTIONS:

1. The typed project report must be bound and submitted by each student before the end of the term.
2. One extra copy of the project report per batch must be submitted to the examiner.

REFERENCES

S. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	Bosschart	Printed Circuit Board - Design and Technology			



PROGRAMME TITLE :Diploma in Electronics & Telecom. Engineering
SEMESTER : Six

Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory					
			L	P	Total	TH	TS	PR	OR	TW	Total
ET 15617	ADVANCED POWER ELECTRONICS **(E3)**		**4**	2	6	80	20	50	-	25	175

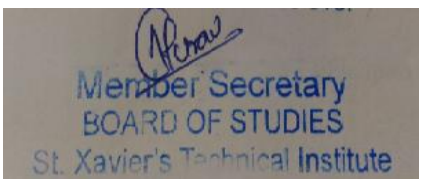
1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of Practicals is Internal and External.
4) The assessment of Term-Work is Internal.

RATIONALE:

This subject is classified under Applied Technology courses. In the past decade there has been a rapid development in the field of Power Electronics with the development of newer and high speed power switching and control devices. This subject attempts to cover these new developments and devices along with their applications in the power industry in detail, along with the theoretical background of the construction, characteristics and working of the same. This subject will enable the students to comprehend the theory, construction, concepts and working principles of various advanced power electronic devices and circuits and their applications in industry. The knowledge acquired by student will help them to design, test, troubleshoot and repair power electronic circuits and systems that are widely used in heavy industries, switching and control systems, induction heating, resistance welding and so on.

COURSE OUTCOMES & CO PO MAPPING

SEM VI C 315	ADVANCED POWER ELECTRONICS ELECTIVE II (15 TH COURSE IN THIRD YEAR)
C 315.1	Illustrate the turn on & turn off mechanism of SCR
C 315.2	Demonstrate the need, function and operation of Inverter
C 315.3	Select appropriate Chopper for DC control drives
C 315.4	Compare the principles of AC,DC & Microprocessor, MC based drive
C 315.5	Enumerate the operation of Power electronics applications
C 315.6	Implement safety measures for over-voltage & over-current fault conditions in power electronics application



Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM VI C 315	ADVANCED POWER ELECTRONICS ELECTIVE II (15 TH COURSE IN THIRD YEAR)PREPARED BY : VR									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C 315.1	2	3	3			1			1	3
C 315.2	2	3	3			2		2	1	3
C 315.3	3	3	3			2		2	1	3
C 315.4	3	3	3	3	2	2		2	1	3
C 315.5	3	3	3			2		2	1	3
C 315.6	2	3	3			3			1	3
C 315 TOTAL	15	18	18	03	02	12	00	08	06	18
CORRELATION LEVEL	3	3	3	1	0	2	0	1	1	3

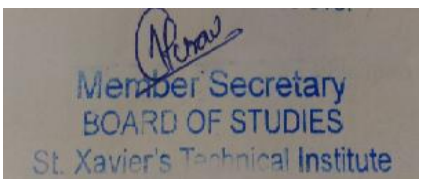
TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	06	12	18
CORRELATION LEVEL	1	2	3

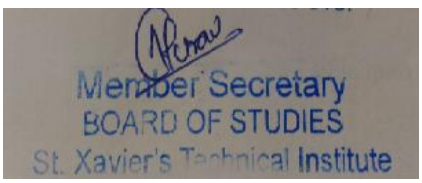
CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

Dr. V. R. Rathod

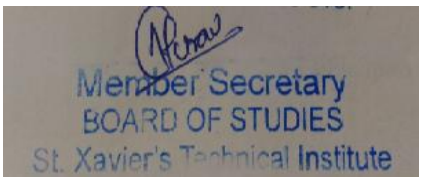
Subject Expert



SECTION 1			
Sr. No.	Name of the Topic	Periods	Marks
01	**Turn on and off mechanism of SCR C315.1** 1. Commutation of SCR. 1.1 Introduction 1.2 Turn on method of SCR 1.3 Dynamic Turn on switching characteristics 1.4 Turn off mechanism 1.5 Turn off methods (commutations) 1.6 Types of commutation Natural and Forced commutation 1.7 Classification of Forced commutation 1.7.1 Class A Commutation – Resonant Commutation 1.7.2 Class B Commutation – Self Commutation 1.7.3 Class C Commutation – Complementary Commutation. 1.7.4 Class D Commutation – Auxiliary Commutation. 1.7.5 Class E Commutation – External Pulse Commutation. 1.7.6 Class F Commutation – AC Line Commutation.	12	16
02	**Inverters C315.2** 2.1 Introduction 2.2 Working Principle of Inverters 2.3 SCR Inverters Classification a) Method of Commutation b) According to Connections 2.4 Series Inverter 2.5 Parallel Inverter 2.6 Bridge Inverters 2.6.1 Half bridge 2.6.2 Full bridge 2.7 Voltage control methods of Single phase Inverters 2.7.1 External control of A.C. Output voltage 2.7.2 External control of D.C. Input voltage	10	12

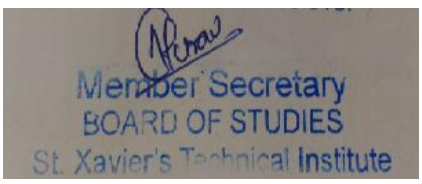


03	**Choppers C315.3** 3.1 Introduction 3.2 Methods available for obtaining D.C. voltage from a Fixed DC Voltage. 3.2.1 Line Commutated convertors 3.2.2 AC link Chopper (Inverter Rectifier) 3.2.3 DC Chopper (DC-DC Power Convertor) 3.3 Basic Chopper Classification 3.3.1 According to the input / output voltage loads. 3.3.1.1 Step Down 3.3.1.2 Step Up 3.3.1.3 Step Up-Down 3.3.2 According to the direction of output voltage and current 3.3.2.1 Class A, B, C, D, E choppers 3.3.2.2 First quadrant, Two quadrant, Four quadrant Chopper	10	12
	SECTION 2		
04	**Solid state control of D.C. & A.C. Control Drives.C315.4** 4.1 Block schematic of DC Control Drive. 4.2 Block schematic of AC Control Drive. 4.3 Block schematic of microprocessor & microcontroller based Control Drives.	12	16
05	**Power Electronics Applications C315.5** 5.1LDR Application in a light activated turn off circuit 5.2 Illumination control using SCR 5.3 UPS	10	12
06	**Protection and Cooling of Power Switching Devices C315.6** 1.1 Overvoltage conditions 1.2 Overvoltage Protection 1.3 Overcurrent Conditions 1.4 Overcurrent Protection	10	12



LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	SCR Characteristics	C315.1
2	Turn on Methods of SCR (Practical 1)	C315.1
3	Turn on Methods of SCR (Practical 2)	C315.1
4	Commutation of SCR (Practical 1)	C315.1
5	Commutation of SCR (Practical 2)	C315.1
6	dv/dt Limitation of SCR	C315.2
7	SCR Circuit Breaker	C315.2
8	Series Inverter	C315.2
9	Parallel Inverter	C315.2
10	Chopper Circuits	C315.3
11	SCR triggering by microcontroller (Microcontroller based firing angle control	C315.4
12		
13		
14		
15		



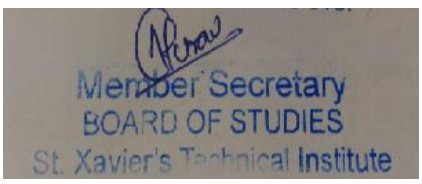
The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C315.1 (out of 25)	C315.1 (out of 25)	C315.1 (out of 25)	C315.1 (out of 25)	C315.1 (out of 25)	C315.2 (out of 25)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
…….							

* The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1	Turn on and off mechanism of SCR	12	8	4	4	16
2	Inverters	10	6	4	2	12
3	Choppers	10	6	4	2	12
Section II						
4	Solid state control of D.C. & A.C. Control Drives	12	6	6	4	16
5	Power Electronics Applications	10	4	4	4	12
6	Protection and Cooling of Power Switching Devices	10	4	4	4	12
Total		64	34	26	24	80



IMPLEMENTATION STRATEGY

1.Teaching plan
2.Minimum 10practicals
The table to measure the attainment levels for PRACTICAL EXAMINATION (on a rating scale of "out of 50') of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C315.1 (out of 50)	C315.1 (out of 50)	C315.1 (out of 50)	C315.1 (out of 50)	C315.1 (out of 50)	C315.2 (out of 50)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
…….							

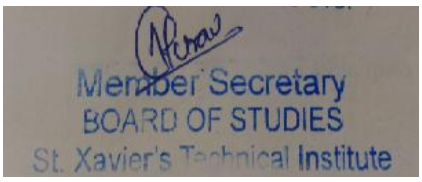
* The final % attainment level for PRACTICAL EXAMINATION of each course outcome may then be computed and the overall % attainment level for the course, for practical exam may then be calculated.

REFERENCES

S. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	S K Bhattacharaya	Industrial Electronics& control		2000	Tata Mcgraw Hill
3.	P.C. Sen	Power Electronics	1st	1987	Tata Mcgraw Hill
4.	M. D Singh & K B Khanchandani	Power Electronics	1st	2007	Tata Mcgraw Hill
5	M.H .Rashid	Power Electronics	1st	2000	Tata Mcgraw Hill

E-REFERENCES

www.nptel.ac.in/courses/108101038
www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-334-power-electronics-spring-2007
www.nptelvideos.in/2012/11/po wer-electronics.html
www.coursera.org/learn/power-electronics
www.powerguru.org/power-electronics-videos/



PROGRAMME TITLE: Diploma in Electronics & Telecom. Engineering ***SEMESTER :*** Six											
Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 15618	SCILAB **(No Theory exam)**		-	2	2	-	-	-	-	50	50
The assessment of term work is Internal.											

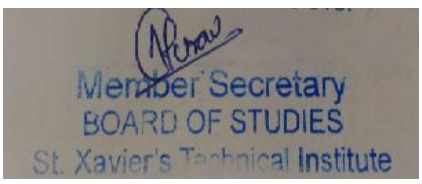
RATIONALE:

Various numerical computations can be done in the Engineering and Mathematics field by providing various continuous inputs to the system over a period of time. This could be observed statistical data. Along with this the trend of the possible output/s can be fed into the system to that the system develops an artificial learning capability. Thus such a system can be useful for analyzing and predicting possible behavior, solutions and outputs for a given problem or task. Thus Scilab provides the basic foundation that can be used to build upon the various intricacies of artificial intelligence. The study of Scilab is therefore an essential requirement for further study and analysis in areas related to artificial intelligence.

Scilab is free and open source software for numerical computation providing a powerful computing environment for engineering and scientific applications.

COURSE OUTCOMES & CO PO MAPPING

SEM VI C 316	SCILAB (16 TH COURSE IN THIRD YEAR)
C 316.1	Illustrate concepts of Scilab
C 316.2	Categorise basics commands in Scilab
C 316.3	Formulate mathematical problems and implement in Scilab
C 316.4	Design 2-D & 3-D Visualization using Scilab
C 316.5	Implement Control systems operations & Signal Processing operations using Scilab
C 316.6	Demonstrate Modeling & Simulation using XCOS Simulator in Scilab



Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM VI C 316	SCILAB (16 TH COURSE IN THIRD YEAR)PREPARED BY : RS									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C 316.1	1	2	1					2		1
C 316.2	3	2	2	2		1		2		2
C 316.3	3	1	2	3		1		2		2
C 316.4	2	3	3	2				1		3
C 316.5	3	1	3	1		1		2		2
C 316.6	3	1	2	3		1		2		2
C 316 TOTAL	15	10	13	11	00	04	00	11	00	12
CORRELATION LEVEL	3	2	2	2	0	1	0	2	0	2

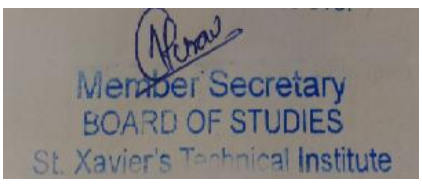
TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	06	12	18
CORRELATION LEVEL	1	2	3

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

Mr. Rakesh Saroj

Subject Expert



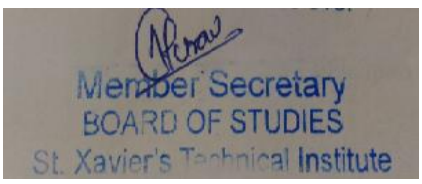
Scilab is released as open source under the CeCILL license (GPL compatible), and is available for download free of charge. Scilab is available under GNU/Linux, Mac OS X and Windows XP/Vista/7/8.
Scilab includes hundreds of mathematical functions. It has a high level programming language allowing access to advanced data structures, 2-D and 3-D graphical functions.

A large number of functionalities are included in Scilab:

- **Maths & Simulation**
  For usual engineering and science applications including mathematical operations and data analysis.
- **2-D & 3-D Visualization**
  Graphics functions to visualize, annotate and export data and many ways to create and customize various types of plots and charts.
- **Optimization**
  Algorithms to solve constrained and unconstrained continuous and discrete optimization problems.
- **Statistics**
  Tools to perform data analysis and modeling
- **Control System Design & Analysis**
  Standard algorithms and tools for control system study
- **Signal Processing**
  Visualize, analyze and filter signals in time and frequency domains.
- **Application Development**
  Increase Scilab native functionalities and manage data exchanges with external tools.
- **Xcos - Hybrid dynamic systems modeler and simulator**
  Modeling mechanical systems, hydraulic circuits, control systems...

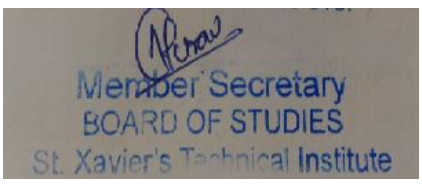
In this subject therefore the teacher will provide example situations/ problems which will have to be resolved and the output computed by the student using Scilab.

This subject carries only term work marks. There is no theory examination. There is no practical examination.



LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	Calculations using scilab	C316.2
2	Creating and working with array of numbers	C316.3
3	To perform different matrix operations using scilab	C316.3
4	To generate addition and subtraction of two given signal (discrete and continuous domain)	C316.4
5	To plot continuous and discrete time unit step, ramp and exponential signal	C316.4
6	To plot sine and cosine functions in scilab	C316.4
7	To plot convolution of two given sequences	C316.5
8	To plot cross correlation of two sequences	C316.5
9	To plot auto correlation of two sequences	C316.5
10	To plot impulse function of a signal	C316.4
11	To compute pole zero plot of a given function	C316.5
12	To plot root locus of a given function	C316.5
13	To perform simulation using xcos simulator (practise 1)	C316.6
14	To perform simulation using xcos simulator (practise 2)	C316.6
15	To perform simulation using xcos simulator (practise 3)	C316.6



The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 50') of the defined course outcomes is as shown in the format given below:

(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C316.2 (out of 50)	C316.3 (out of 50)	C316.3 (out of 50)	C316.4 (out of 50)	C316.4 (out of 50)	C316.4 (out of 50)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
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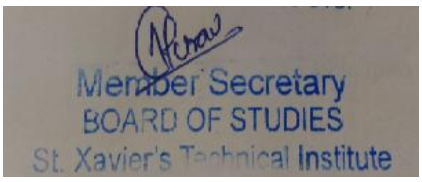
* The final % attainment level of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.



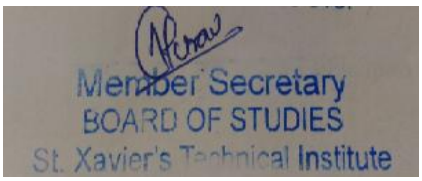
PROGRAMME TITLE : Diploma in Electronics & Telecom. Engineering ***SEMESTER :*** Six											
Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 15620	**INDUSTRIAL MANAGEMENT & QUALITY CONTROL**		**3**	-	3	80	20		-	-	100
1) Theory paper duration 3 hrs. 2) Theory paper assessment is Internal and External.											

RATIONALE:

As the title of the course suggests, two major areas are to be focused upon during coverage, discussion and delivery of the topics. Management in any industry deals with aspects pertaining to finances, research, development of new products, human resources, manufacturing, sales and distribution processes, purchases, demand and supply principles and personnel organization, relationships and management. Quality Control of any final product is through continuous documentation, monitoring, maintaining all aspects from production to costing to marketing to sales and consumer requirements and behavior, and all the processes involved right from procurement of raw materials to the development and mass manufacturing of the final product. Upon emerging as a final product, it's quality is to be tested, monitored, documented and maintained for consistency of performance with the highest quality possible, ideally nearing a perfection level of 100%.The objective of this course is to impart the intricacies involved in all the processes pertaining to "Industrial Management and Quality Control".

COURSE OUTCOMES & CO PO MAPPING

SEM VI C 317	INDUSTRIAL MANAGEMENT & QUALITY CONTROL ELECTIVE II (17 TH COURSE IN THIRD YEAR)
C 317.1	**Differentiate between Administrations and organizations**
C 317.2	**Communicate effectively in variety of organizational setting.**
C 317.3	**Identify the personal characteristics that reflect on the general work needed for the career.**
C 317.4	**Implement the cost concept and cost estimation for the project budgets and plans.**
C 317.5	**Analyze the concept of quality control and statistical process control.**
C 317.6	**Interpret the different meanings of quality concepts and its influence.**



Mapping of Course outcomes (COs) to Program outcomes (POs)

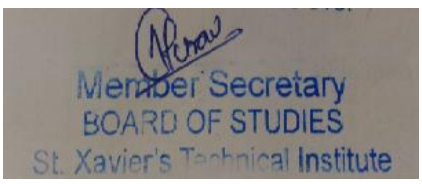
SEM VI C 317	INDUSTRIAL MANAGEMENT & QUALITY CONTROL ELECTIVE II (17 TH COURSE IN THIRD YEAR) PREPARED BY : VR									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C 317.1					2	2	2	2		1
C 317.2									3	
C 317.3					3	3	2	2	2	2
C 317.4					2	2	2	3	2	2
C 317.5					2	2	2	3		2
C 317.6					2	2	2	2		2
C 317 TOTAL					11	11	10	12	7	9
CORRELATION LEVEL					2	2	2	2	1	1

TABLE TO DECIDE CORRELATION LEVELS

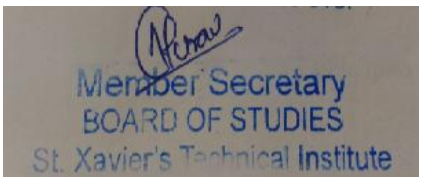
CO SUM TOTAL	6	12	18
CORRELATION LEVEL	1	2	3

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

Subject Expert
Dr.S.B.Ghungrad
Dr. V. R. Rathod



SECTION 1			
Sr. No.	Name of the Topic	Periods	Marks
01	**INDUSTRIAL MANAGEMENT & QUALITY CONTROL C 317.1** **Principles and Techniques of Management** 1.1 Meaning of and differences among business, management, administration and organization 1.2 Principles of management. 1.3 Functions of management. 1.4 Organizational Hierarchy	07	12
02	**Market and Materials Management. C317.2** 2.1.1 Marketing strategy, Market research. 2.1.2 Consumer behavior, advertising and sales promotion. 2.1.3 Channels of distribution, pricing of products.	08	12
03	**Human Resource Management C317.3** 3.1.Meaning and functions of Human Resource management. 3.2.Recruitment, selection, promotion, wages and salary administration, training and development.	08	16
SECTION 2			
04	**Project and Financial Management C317.4** 4.1 Case studies of project report, preparation of profit and loss statement and balance sheet, ratio analysis. 4.2 Principles of costing, cost sheet preparation, variance analysis, meaning and application of various budgets, types of budgets and their importance.	09	12
05	**Quality Control C317.5** 5.1 Concept of quality and quality control, elements of quality, factors controlling quality of design and conformance, 5.2 process control, inspection planning and scheduling, 7QC (Seven Quality Control) techniques.	08	16
06	**Quality Management C317.6** 6.1 Concepts and applications of Kaizen, quality circle 6.2ISO 9000 series, just-in-time, quality planning and total quality management	08	12



SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1	Principles and Techniques of Management	07	02	04	06	12
2	Market and Materials Management	08	02	04	06	12
3	Human Resource Management	08	04	04	08	16
Section II						
4	Project and Financial Management	09	02	04	06	12
5	Quality Control	08	04	04	08	16
6	Quality Management	08	02	04	06	12
Total		48	16	24	40	80

IMPLEMENTATION STRATEGY

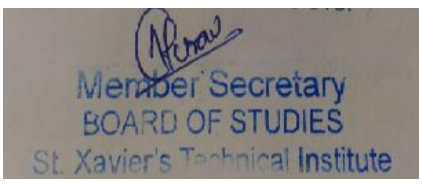
1.Teaching plan

REFERENCES

S. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	O P Khanna	INDUSTRIAL ENGINEERING AND MANAGEMENT		2011	JAIN BOOK DEPOT,Post Box No. 51, New Delhi - 110001 (INDIA),81-899-2835-3
2.	Telsang Mertand.	INDUSTRIAL & BUSINESS MANAGEMENT			T, S.Chand & Company Limited NEW DELHI. ,81-219-2056-6.
3.	Anil Bhat, Arya Kumar	MANAGEMENT : PRINCIPLES, PROCESSES, AND PRACTICES		2008	Oxford University Press, NEW DELHI., 978-01-956-9445-1
4.	Dr. S. Kumar	TOTAL QUALITY MANAGEMENT		2006	,LAXMI PUBLICATIONS(P) LTD, NEW DELHI

E-REFERENCES

www.nptel.ac.in/courses
https://www.britannica.com
https://www.tutorialspoint.com



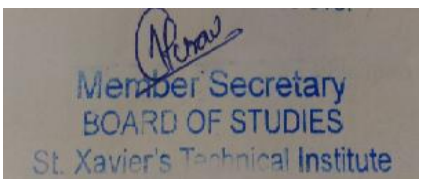
PROGRAMME TITLE: Diploma in Electronics & Telecom. Engineering **SEMESTER :** SIXTH										
Course Code	Course Title	Prerequisite	Credits		Examination Scheme					
					Theory					
			PR	Total	TH	TS	PR	OR	TW	Total
ET 15621	TECHNICAL WRITING		2	2	-	-	-	-	50	50
1) The assessment of Term-Work is Internal.										

RATIONALE:

Technicalwriting is any written form of writing or drafting technical communication used in a variety of technical and occupational fields.This course will enable the students to analyze the complex technical information and present it in a format that is easy to read and understand. The course includes writing research proposal,writing for Electronic Media such asEmails, letters etc which are some of the most frequently written documents in a business, technical reports to provide readers with information, instructions and analysis on any task and instructional documents like user manuals and troubleshooting guides for electronic equipments.

EXPECTED COURSE OUTCOMES

SEM VI C318	**TECHNICAL WRITING (18TH COURSE IN THIRD YEAR)**
C318.1	**Distinguish between Data Collection Methods**
C318.2	**Justify Interpretation technique used for specific Data**
C318.3	**Organise steps in report writing**
C318.4	**Design Instructional manuals and technical specifications for users**
C318.5	**Categorise types of papers and prepare presentation for conference**



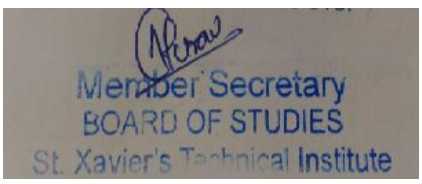
Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM VI C318	TECHNICAL WRITING (18TH COURSE IN THIRD YEAR) PREPARED BY : MM									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C318.1	1	2	-	1	1	1	2	2	1	1
C318.2	-	1	-	2	1	2	2	2	2	1
C318.3	-	-	-	-	1	2	3	3	3	1
C318.4	1	1	2	-	2	3	3	3	2	2
C318.5	-	2	2	1	2	2	3	3	3	1
C 318 TOTAL	2	6	4	4	7	10	13	13	11	6
CORRELATION LEVEL	0	1	1	1	1	2	2	2	2	1

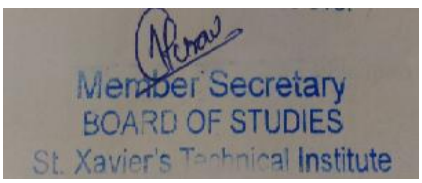
CO SUM TOTAL	6	12	18
CORRELATION LEVEL	1	2	3

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

Subject Expert
Dr. Vijay Rathod
Mr. M. M. Munde



SECTION 1		
Sr. No.	**Name of the Topic**	**Periods**
01	**Introduction** ***C 318.1*** 1.1 Introduction 1.2 Collection of Primary data 1.3 Data collection Methods: Observation Method, Interview Method, Questionnaires Method, Schedules Method. 1.4 Comparison of Data collection Methods.	6
02	**Interpretation of Data** **C318.2** 2.1 Meaning of Interpretation 2.2 Why Interpretation? 2.3 Techniques of Interpretation 2.4 Precautions in Interpretation	4
SECTION 2		
Sr. No.	Name of the Topic	Periods
03	**Introduction to Writing** **C318.3,C318.4** 3.1Introduction to Technical Writing 3.2 Types of Technical Writing: Procedural Writing, Paragraph Writing, Report Writing, Writing for Electronic Media 3.3 Significance of Report Writing 3.4 Different steps in report writing 3.5 Layout of report 3.6 Types of reports 3.7 How to write: Technical Specifications, User Manuals, User Guides, Installation Guides, Online Helps, 3.8 Instructional Manuals and Reports for troubleshooting: steps to follow for fault findings	10
04	**Research paper writing and presentation** **C318.5** 4.1 Types of research paper: Argumentative papers, Analytical papers, Defination papers, Compare and Contrast papers, Cause and effect papers, Imperative papers. 4.2 General Guidelines for preparing paper : Conference Paper, Journal Paper, Technical Article, Newsletter. 4.3 Mechanics of writing research report. 4.4 Precautions of writing research report. 4.5 Effective Oral Presentation	10



LIST OF LABORATORY EXPERIENCES/ ASSIGNMENTS

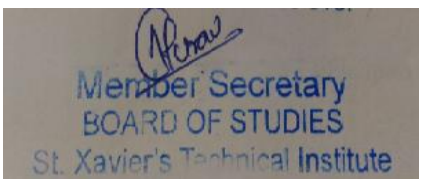
EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	ASSIGNMENT 1 – Types of Data	**318.1**
2	ASSIGNMENT 2 – Technical Writing/ Technical Communication	**318.3**
3	ASSIGNMENT 3 – Feedback Survey Form/ Questionnaire Design using Google Forms	**318.2**
4	ASSIGNMENT 4 – Seminar Paper/ Presentation	**318.4**
5	- - - - - - - - - - - - - - -	**318.X**

IMPLEMENTATION METHOD:

All assignments are designed, conducted, implemented, worked upon, submitted and assessed **ONLINE** using **Google Classroom – a technology introduced by Google in 2014, under G-Suite For Education for our domain www.xtechacademicrecords.com** ; The G-Suite for Education dedicated account was approved for St. Xavier's Technical Institute in 2016.

Technical Writing is the first subject for which this has been implemented for distribution of assignment topics, implementation and submission by students and assessment by teachers.

IMPLEMENTATION STRATEGY
Minimum 5 Assignments (Conducted Online using Google Classroom)



The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 50') of the defined course outcomes is as shown in the format given below:

(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C318.1 (out of 50)	C318.3 (out of 50)	C318.2 (out of 50)	C318.4 (out of 50)	C318.5 (out of 50)	C318.X (out of 50)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
…….							
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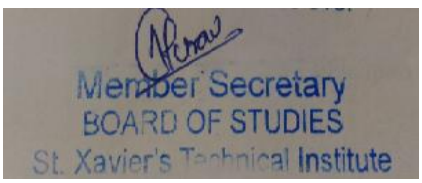
* The final % attainment level of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	C. R. Kothari	Research Methodology (Methods and Techniques)	2nd		Newage International Pvt. Ltd.
2.	Sharma	Business Correspondence & Report Writing			
3.	Sashi Kumar	Spoken English (with Cassette)			TMH