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
PRINCIPAL
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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).
- 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 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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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.
- All practical exams/ oral are External and Internal .
- All online exams 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).
- 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 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

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Revised and Effective from July 2020 | **TEACHING AND EXAMINATION SCHEME** | **SEMESTER FIVE ***

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	Microprocessors and Microcontrollers	ET-18519	4	xx	2	6	3	100	40	50	20	xx	xx	25	10	175
2	Signals and Systems	ET-18512	3	1	2	6	3	100	40	50	20	xx	xx	25	10	175
3	Advanced Communication Systems	ET-18513	4	xx	2	6	3	100	40	50	20	xx	xx	25	10	175
4	Project I	ET-18514	xx	xx	2	2	xx	xx	xx	xx	xx	xx	xx	50	20	50
5	Basic Control Systems (E1)	ET-18520	4	xx	2	6	3	100	40	50	20	xx	xx	25	10	175
6	Vocational Training	ET-18516	xx	xx	6	(4+2) =6	xx	xx	xx	xx	xx	50	20	50	20	100
7	Circuit Simulation and PCB Design	ET-18517	xx	xx	2	2	xx	xx	xx	50	20	xx	xx	25	10	75
8	PLC Systems and Applications (E1)	ET-18518	4	xx	2	6	3	100	40	50	20	xx	xx	25	10	175
	TOTAL		**15**	**1**	**18**	**34**		**400**		**300**				**225**		**925**
	Total Number of Credits, Student Contact Hours =					**34**										**Total Marks =** **925**

Abbreviations:

1)	TH	Theory
2)	TU	Tutorial
3)	PR	Practical
4)		No Theory Exam
5)	E1	Elective One

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

* With approved revisions for the academic year 2017-2018, July 2017.

* Basic control Systems in semester five to be offered as an elective course (**E1**) against PLC Systems and applications.

NOTE:

For Signals and Systems and Advanced Communication Systems – Practical Exam introduced (instead of oral exam) from December 2015/ January 2016 – ACTUALLY TO BE IMPLEMENTED from July 2016

Subject to revision for the academic year 2017-2018 during which Industrial Electronics will be replaced by Basic Control Systems (with a new course code), along with other revisions.

Academic Year 2017-2018:

Microprocessor- ET 11511 subject was replaced by " Microprocessors And Microcontrollers" - ET-15519

Industrial Electronics replaced by Basic Control Systems - ET-15520
Academic Skills- ET-11519 was removed

All course codes changed from 115……series to 155…..series from the academic year 2017-2018. Similar change will be made in the course codes in January 2018 for the sixth semester.

All course codes changed from 155……series to 185…..series from the academic year 2020-2021. Similar change will be made in the course codes in January 2021 for the sixth semester.

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

Course Code	Course Title		Credits			Examination Scheme					
						Theory					
			L	P	Total	TH	TS	PR	OR	TW	Total
ET 18519	Microprocessors And Microcontrollers		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:

This subject which comes under the Applied Technology group will enable the students to comprehend the theory, concepts, working of microprocessors and microcontrollers, their programming and also their applications in electronic systems. The knowledge acquired by student will help them to design, test, troubleshoot and program microcontroller based systems. Knowledge of microprocessors will provide a quicker grasping and understanding of the internal working and operation of microcontroller based control systems in industry.

SEM V C301	MICROPROCESSORS AND MICROCONTROLLERS (IST COURSE IN THIRD YEAR)
C301.1	Classify the basic elements and functions of Microprocessors 8085 and 8086.
C301.2	Analyze the architecture of 8051 Microcontrollers.
C301.3	Develop assembly language program for microcontroller applications.
C301.4	Illustrate the functions of SFRs in microcontroller applications.
C301.5	Interface the special purpose peripherals 8255 and 0808 with 8051 microcontroller.
C301.6	Demonstrate the designing of a microcontroller based system.

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

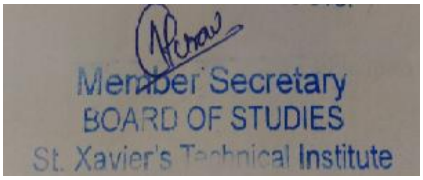
SEM V C301	MICROPROCESSORS AND MICROCONTROLLERS (IST COURSE IN THIRD YEAR) PREPARED BY : AG									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C301.1	1		3		1				1	1
C301.2	1	1	3		1	1			1	1
C301.3	2	2	3		1	1			1	1
C301.4	1	2	3		1			1	1	1
C301.5	1	2	3			1		1	1	1
C301.6	1	2	3			1		1	1	1
C 301 TOTAL	07	09	18	00	04	04	00	03	06	06
CORRELATION LEVEL	1	2	3	0	1	1	0	1	1	1

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

Subject Experts
Mr. R. V. Gheware
Mr.Anil Gurav



Sr. No.	Name of the Topic	Periods	Marks
	SECTION 1		
01	**Microprocessor Introduction** C301.1 1.1 Simplified Block diagram of Microprocessor System, Buses & Their types: Address bus, Data bus & Control Bus. 1.2 Features of 8085, Pin Diagram ,Internal Block Diagram of 8085 1.3 Salient features of 8086 Microprocessor, 1.4 Architecture of 8086, register organization, Memory segmentation, Concepts of pipelining. 1.5 Comparison between 8085 & 8086 processor	12	14
02	**Microcontroller 8051** C301.2 2.1 Comparison between Microprocessor & Microcontroller. 2.2 Specifications of MCS-51 Microcontrollers. 2.3 Pin Diagram of 8051. 2.4 Internal block diagram of 8051, memory organization. 2.5 8051 machine cycle concept, significance of flags, ports.	10	12
03	**Instruction set** C301.3 3.1 Detailed study of 8051 Instructions, instruction classification, addressing modes. 3.2 8051 Programming: 8051 Programs for simple arithmetic and Logical problems. 3.3 Concept of Subroutine & Stack , Delay Subroutine	10	14
	SECTION 2		
04	Significance & Applications of SFR's of 8051 C301.3, C301.4 4.1 Format of SFR's - TMOD, TCON, SCON, SBUF, IE, IP 4.2 Concept of Interrupt & Interrupt Service routine (ISR) 4.3 Programs for using timer,Programs for serial data communication.	12	16
05	Interfacing with external chips C301.5 5.1 Semiconductor Memory: RAM, EPROM 5.2 Study of Peripherals PPI 8255 interfacing with UC 8051.	10	12
06	**Applications of 8051** C301.3, C301.6 6.1 ADC 0808-interfacing with 8051.8051 Program to read data from ADC. 6.2 Concept of keyboard and Display & its interfacing. 8051 program to display some numbers/characters on multiplexed display. 6.3 Stepper Motor interfacing & 8051 program to control stepper motor.	10	12

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	Demonstration of 8085 AND 8051 System and use of 8051 assembler, simulator	C301.2
2	8051 program to move a block of data to other memory locations and to compliment a block of data in successive memory locations	C301.3
3	8051 program to find largest and smallest of 8 bit numbers stored in successive memory locations	C301.3
4	8051 program to sort five 8 bit numbers in ascending as well as descending order	C301.3
5	8051 program to search given byte of block in external memory and to convert a 2 digit BCD number to Hex	C301.3
6	To add five bytes in successive memory locations of external memory and do the same for program memory AND program to transmit and receive five bytes serially	C301.3
7	Using assembly language/ embedded C Program to flash L.E.D. interfaced to port of 8051.using (a) delay subroutine (b) using one of the timers of 8051 microcontroller	C301.6
8	Using assembly language/ embedded C Program read data from an ADC interfaced to the 8051 microcontroller	C301.6
9	To interface a keyboard with 8051 and read data using assembly language/ embedded C Program	C301.5
10	Using assembly language/ embedded C Program interface seven segment LED display with 8051	C301.6
11	Using assembly language/ embedded C Program interface a stepper motor with 8051.	C301.6
12	Study of Hardware Interrupts	C301.4
13	To Interface LCD's	C301.6
14	To generate square and sawtooth waves using DAC 0832	C301.5
15	Interfacing 8051 with a DC Motor	C301.6

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

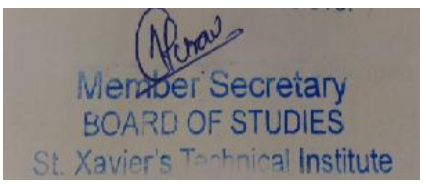
Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1	Microprocessor Introduction	12	02	04	08	14
2	Microcontroller 8051	10	02	04	06	12
3	Instruction set	10	02	04	08	14
Section II						
4	Significance & Applications of SFR's of 8051	12	04	04	08	16
5	Interfacing with external chips	10	02	04	06	12
6	Applications of 8051	10	02	04	06	12
Total		64	14	24	42	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	C301.2 (out of 25)	C301.6 (out of 25)	C301.6 (out of 25)	C301.6 (out of 25)	C301.6 (out of 25)	C301.6 (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	C301.2 (out of 50)	C301.6 (out of 50)	C301.6 (out of 50)	C301.6 (out of 50)	C301.6 (out of 50)	C301.6 (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 / assignments

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	Intel	Intel data sheets	-	-	Intel USA
2.	Muhammad Ali Mazidi	The 8051 microcontroller	1st	2002	Pearson Education Delhi Branch
3.	Kenneth Ayala	The 8051 microcontroller	1st	1988	Prentice Hall Int
4.	Douglas V. Hal	Microprocessors & Interfacing Programming & Hardware			McGraw Hill International Edition

E-REFERENCES

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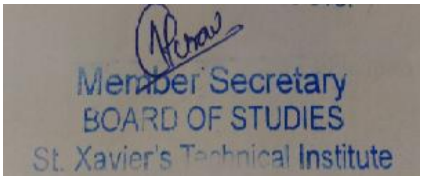
www.Youtube.com
www.keil.com



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

Course Code	Course Title	Prerequisite	Credits				Examination Scheme					
			L	T u	P	Total	Theory TH	Theory TS	PR	OR	TW	Total
ET 18512	SIGNALS AND SYSTEMS		3	1	2	6	80	20	**50**	-	25	175

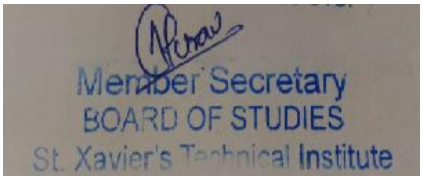
1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of **PRACTICAL EXAM** is Internal and External.
4) The assessment of Term-Work is Internal

RATIONALE:

This subject which comes under the Applied Technology category is designed to provide a platform for engineers and designers who would like to work in the most challenging and emerging field of signal processing. As high speed computational machines are now available for processing, the concepts and techniques allied with signal processing field assume a broader and a versatile approach. Thus the study of signals and systems has opened up a whole new era of solutions to resolve many intricate signal processing problems.

COURSE OUTCOMES & CO PO MAPPING

SEM V C 302	SIGNALS AND SYSTEMS (2 ND COURSE IN THIRD YEAR)
C302.1	Classify different signals mathematically and perform mathematical operations on signals
C302.2	Compare different systems and identify them by their properties
C302.3	Illustrate the process of Linear Convolution & its properties in discrete and continuous time domain
C302.4	Demonstrate the properties of Fourier Series and Fourier Transform in discrete and continuous time domain
C302.5	Compute Z-Transform for discrete time signals using its properties
C302.6	Implement different methods of Inverse Z-Transform with examples



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

SEM V C 302	SIGNALS AND SYSTEMS (2 ND COURSE IN THIRD YEAR) PREPARED BY : KHK									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C302.1	3	3	3	3	2			3	1	2
C302.2	3	3	3	3	2			3	1	2
C302.3	3	3	3	3	2			3	1	2
C302.4	3	3	3	3	2			3	1	2
C302.5	3	3	3	3	2			3	1	2
C302.6	3	3	3	3	2			3	1	2
C 302 TOTAL	18	18	18	18	12	00	00	18	06	12
CORRELATION LEVEL	3	3	3	3	2	0	0	3	1	2

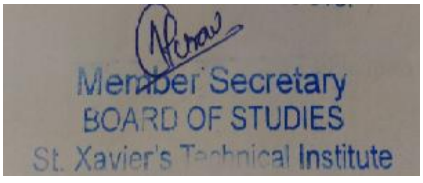
TABLE TO DECIDE CORRELATION LEVELS

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

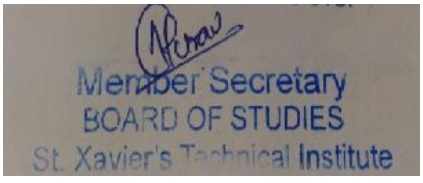
Mr. K. H. Kamath

Subject Expert



SECTION 1			
Sr. No.	Name of the Topic	Periods	Marks
01	**Introduction C302.1 C302.2** 1.1 Classification of Signals – Continuous and Discrete, Periodic and Non periodic, Even and Odd, Energy and Power, Deterministic and Random type 1.2 Standard Signals – Unit impulse, unit step, unit ramp, exponential, sinusoidal type Classification 1.3 Basic operation of signals – Amplitude scaling, Time shifting, Time scaling etc. 1.4 Classification of Systems – Static and Dynamic, Time Variant and Time Invariant, Linear and Nonlinear, Causal and Anti-causal, Stable and Unstable	09	15
02	**Time Domain Representation for LTI Systems C302.3** 2.1 Convolution for C.T. Systems – Representation of C.T. Signal in terms of Impulses 2.2 Convolution Sum – Convolution for D.T. Systems 2.3 Linear Convolution 2.4 Methods of Convolution: Graphical method Using mathematical equation of convolution Tabulation method 2.5 Properties of Linear Convolution 2.6 Series and Parallel connection of systems 2.7 Differential Equation representation for LTI Systems- Zero input response and Zero state Response 2.8 Impulse Response of LTI Systems 2.9 Finite Impulse Response (FIR) and infinite Impulse Response (IIR) Systems 2.10 Correlation – Auto Correlation and Cross Correlation	15	25

SECTION 2			
03	**Fourier Representation of Continuous Time and Discrete Time Signals C302.4** 3.1 Fourier Series 3.2 Properties of Fourier Series 3.3 Fourier Transform 3.4 Properties of Fourier Transform (proof of properties not expected) 3.5 Discrete Time Fourier Series (DTFS) 3.6 Discrete Time Fourier Transform (DTFT) 3.7 Fourier Transform of Standard Signals 3.8 Properties of Fourier Transform for Discrete Time Signals(proof of properties not expected)	09	15
04	**Z-Transform C302.5, C302.6** 4.1 Introduction ,Definition of Z-Transform 4.2 Region of Convergence (ROC) 4.3 Z-Transform of elementary signals 4.4 Properties of Z-transform (proof of properties not expected) 4.5 Inverse Z-Transform (IZT)- Power Series Expansion Partial Fraction Expansion Residue method 4.6 LTI System Analysis using Z-Transform- Pole – Zero Plot System Transfer Function 4.7 Conditions of Causality and Stability in terms of Z-Transform	15	25



LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	Generation of Discrete type Unit Impulse and Unit Step signals	**C302.1**
2	Generation of Discrete type Sine, Cosine, Square and Ramp sequences	**C302.1**
3	Generation of Continuous time and Discrete time Exponential Sequences	**C302.1**
4	Perform basic operations of Addition, Subtraction, X^n, Time Shifting and Time Reversal of a signal	**C302.1**
5	Computation of Linear Convolution	**C302.3**
6	Computation of Auto-correlation and Cross-correlation	**C302.3**
7	Computation of Impulse response of L.T.I. systems	**C302.2**
8	Stability Test using Z-Transform	**C302.5**
9	Power Series Expansion of a Rational Z-Transform	**C302.6**
10	Partial Fraction Expansion of a Rational Z-Transform	**C302.6**
11	Determination of Rational Z-Transform from its Poles and Residues	**C302.5**
12	Determination of Rational Z-Transform from its Poles and Zeros	**C302.5**

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

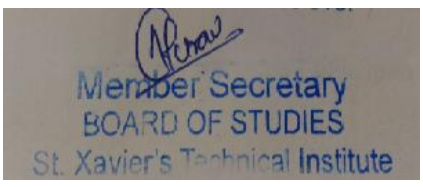
Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1	Introduction	09	02	06	08	16
2	Time Domain Representation for LTI Systems	15	04	08	12	24
Section II						
3	Fourier Representation of Continuous Time and Discrete Time Signals	09	02	06	08	16
4	Z-Transform	15	04	08	12	24
Total		48	12	28	40	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	C302.1 (out of 25)	C302.1 (out of 25)	C302.1 (out of 25)	C302.1 (out of 25)	C302.3 (out of 25)	C302.3 (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	C302.1 (out of 50)	C302.1 (out of 50)	C302.1 (out of 50)	C302.1 (out of 50)	C302.3 (out of 50)	C302.3 (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 using Matlab

REFERENCES

S. No.	Author	Title	Edition	Publisher & Address
1	Simon Haykin and Barry Van Veen	Signals and Systems	2nd	John Wiley
2	Benoit Boulet	Fundamentals of Signals and Systems	1st	Dreamtech
3	Smarajit Ghosh	Signals and Systems	1s	Pearson Education
4	R.A.Barapate J.S.Katre	Signals and Systems	1st	Techmax

E- References :

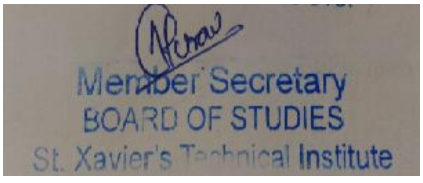
https://www.tutorialspoint.com/signals_and_systems/

https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/lecture-notes/

http://freevideolectures.com/Course/3540/Signals-and-Systems-I

https://engineering.purdue.edu/ChanGroup/ECE302Notes/UCSD_ECE101.pdf

http://nptel.ac.in/downloads/117101055/



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

Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 18513	Advanced Communication Systems	ET15312 ET15412	**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 EXAM** is Internal and External.
4) The assessment of Term-Work is Internal.

RATIONALE:

This subject belongs to the Applied Technology group. As improvement and development in the technology have occurred with tremendous rapidity, in parallel with its increasingly wide scale deployment, Telecommunication and Networking based on Satellite, Microwave and Optical Fiber technology have become major information transmission systems. This has made provisions to improve the transmission standards and fidelity, coupled with an increase in the data rate such that more information is sent and at the same time increasing the transmission distance between relay stations. As a result of accelerating rate of growth of communication technology in research and industry, students who are preparing themselves, and electronics engineers who are working in these areas are faced with the need to understand the theoretical as well as practical design and analysis of satellite and fiber optic communication systems.

COURSE OUTCOMES & CO PO MAPPING

SEM V C 303	ADVANCED COMMUNICATION SYSTEMS (3 RD COURSE IN THIRD YEAR)
C303.1	Distinguish various elements of Satellite communication system and compare the various frequency bands allotted for SATCOM
C303.2	Classify satellite orbits and satellite antennas.
C303.3	Illustrate the working principle of Satellite transmitter, transponder and receiver
C303.4	Select appropriate optical sources and detectors for a given fiber optic link
C303.5	Interpret the constructional features of single mode & multimode fibers
C303.6	Identify the optical losses in optical fiber such as dispersion, scattering, absorption and calculate the fiber optic link budget.

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

SEM V C 303	ADVANCED COMMUNICATION SYSTEMS (3 RD COURSE IN THIRD YEAR) PREPARED BY : JN									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C303.1										2
C303.2	2				2					
C303.3						1				1
C303.4	3		3		1			2		2
C303.5	3		3		1					
C303.6	3		3		3	1		2		2
C 303 TOTAL	11	00	09	00	07	02	00	04	00	07
CORRELATION LEVEL	2	0	2	0	1	0	0	1	0	1

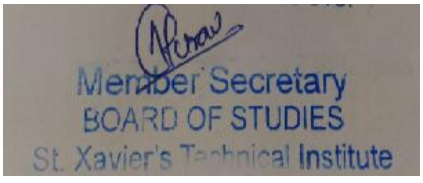
TABLE TO DECIDE CORRELATION LEVELS

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	**Need for SATCOM system**: **C303.1** 1.1 Basic block diagram of SATCOM System. 1.2 Uplink and downlink frequencies. 1.3 Transponder types with reference to frequency bands. 1.4 Advantages and Applications of SATCOM Systems.	05	06
02	**Satellite Orbits: C303.2** 2.1 Geostationary orbit: features, advantages and disadvantages of such orbit. 2.2 Orbital adjustments: station keeping, Satellite spacing (orbital spacing). 2.3 Attitude Control	06	08
03	**Antennas in space: C303.2** 3.1 Earth coverage and narrow directional type. 3.2 Spot beams, Beam shaping, Foot prints, Elevation angle.	06	08
04	**Frequency allocations for satellite broadcast: C303.1** 4.1 Guiding principles, SATCOM frequency bands 6/4 Ghz (C Band) 14/12 Ghz (Ku Band) 30/20 Ghz (Ka Band). 4.2 Comparison of different frequency bands, advantages and disadvantages.	05	06
05	**Block diagram of Earth station C303.3** 5.1 Modulation technique 5.2 Typical C Band up converter, block diagram study. 5.3Typical down converter - LNB, block diagram study	05	06
06	**Satellite transponder: C303.3** 6.1 6/4 GHz (C - band) transponder, block diagram study 6.2 Electrical power subsystem.	05	06

SECTION 2			
07	**Fiber Optic Communication C303.4** 7.1 Light Wave Spectrum 7.2 Advantage & disadvantages of Fiber optic communication. 7.3 Block Diagram of Fiber Optic Communication.	08	12
08	**Fiber Optic Communication & Ray Theory C303.4 C303.5** 8.1 Construction of Fiber Optic Cable. 8.2 Fiber Characteristics & Classification. 8.3 Source & It's Limitations, Construction & working Principle of LED, LASER. 8.4 Detector, Limitation, Construction & working principle, Avalanche Photo Diode. 8.5 Spicing Techniques. 8.6 Definition & Concept of Reflection, dispersion, diffraction. 8.7 Definition of Snell's Law, Numerical Aperture\ Acceptance angle, acceptance cone, Critical Angle	15	20
09	**Losses in Fiber Optic C303.6** 9.1 Attenuation, dispersion-intermodal, intramodal, bend loss, micro macro scattering losses- Linear. Non Linear. Absorption 9.2 OTDR-architecture, functioning & requirements 9.3 Link & power budget calculations	09	08

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	Analog Signal Transmission through Fiber Optic Cable	**C303.5**
2	Voice Signal Transmission through Fiber Optic Cable	**C303.5**
3	Measurement of Bending Losses	**C303.6**
4	Measurement of Cable Losses and Adaptor Losses	**C303.6**
5	LED Source (and Detector) Characteristics	**C303.4**
6	Characteristics of PIN (Detector) Diode	**C303.4**
7	Measurement of Numerical Aperture	**C303.5**
8	Photo Transistor Characteristics	**C303.4**
9	Frequency Modulation	**C303.5**
10	Pulse Width Modulation	**C303.5**
11	Determination of Bit-Rate supported by Fiber Optic Link	**C303.6**
12	Effects of Switched Fault Numbers 1 & 8 on Amplitude Modulation System	**C303.5**
13	Effects of Switched Fault Numbers 4, 5 & 7 in Frequency Modulation	**C303.5**
14	Effects of Switched Fault Numbers 2, 3 & 6 on Pulse Width Modulation	**C303.5**
15	Determination of Sensitivity of Fiber Optic Link	C303.6

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	**Need for SATCOM system (C303.1)**	**05**	**04**	**02**	**--**	**06**
2	**Satellite Orbits (C303.2)**	**06**	**--**	**02**	**06**	**08**
3	**Antennas in space (C303.2)**	**06**	**--**	**02**	**06**	**08**
4	**Frequency allocations for satellite broadcast (C303.1)**	**05**	**02**	**04**	**--**	**06**
5	**Block diagram of Earth station (C303.3)**	**05**	**04**	**02**	**--**	**06**
6	**Satellite transponder (C303.3)**	**05**	**--**	**04**	**02**	**06**

Section II						
7	Fiber Optic Communication (C303.4)	08	02	06	04	12
8	Fiber Optic Communication & Ray Theory (C303.1 & C303.5)	15	02	06	12	20
9	Losses in Fiber Optic (C303.6)	09	--	02	06	08
Total		64	14	30	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	C303.5 (out of 25)	C303.5 (out of 25)	C303.6 (out of 25)	C303.6 (out of 25)	C303.4 (out of 25)	C303.4 (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	C303.5 (out of 50)	C303.5 (out of 50)	C303.6 (out of 50)	C303.6 (out of 50)	C304.4 (out of 50)	C303.4 (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

S. No.	Author	Title	Publisher & Address
1	Gary Miller	Modern Electronic communication	Prentice Hall of India
2	Dennis Roddy	Satellite Communication	Tata McGraw-Hill International
3	Keiser	Optical Fiber Communication	Tata McGraw-Hill International
4	Kennedy Davis	Electronic Communication System	Tata McGraw-Hill
5	A. Selverajan	Optical Fiber Communication	Tata McGraw-Hill
6	N.S. Jadhav, D.D. Ahirrao	Advanced Communication Systems	Vrinda Publications

E-REFERENCES

https://www.tutorialspoint.com/

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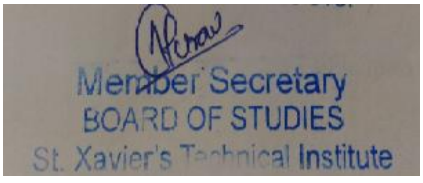
http://nptel.ac.in/downloads/



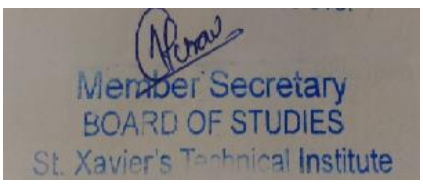
PROGRAMME TITLE : Diploma in Electronics & Telecom. Engineering ***SEMESTER :*** Five											
Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 18514	PROJECT I **(No Theory exam)**		-	**2**	**2**	-	-	-	-	50	50
1) The assessment of project seminar term work is Internal.											

RATIONALE:

Project Seminar comes under Applied Technology group. Project work is undertaken and begins in the fifth semester and continues towards completion in the sixth semester. The Project work undertaken by students in the final year will encompass following activities: Searching for appropriate material; solving problems; analyzing data; maintaining a weekly report book; preparing a report; presenting the project work.
Some of the objectives that the student would achieve by doing project work may be listed as follows:
The student will be able to: plan the project; show decision making skills by taking appropriate decisions at every stage of the project; show problem solving skills by solving problems that may arise at every stage of the project; show confidence to work on one's own and also in a group; Work effectively as a member of a team; use creativity in solving problems and decision making.

COURSE OUTCOMES & CO PO MAPPING

SEM V C 304	PROJECT I (4 TH COURSE IN THIRD YEAR)
C304.1	Select appropriate project title through Literature Survey in the field of interest
C304.2	Analyze the feasibility of implementation of the project
C304.3	Develop confidence to work individually and also in a group
C304.4	Develop report writing and presentation skills



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

SEM V C 304	PROJECT I (4 TH COURSE IN THIRD YEAR)									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C304.1	2	1			3		1	3	3	3
C304.2	2	1	2	2	3		1	3	3	3
C304.3		1	1	2	3	1	2	3	3	3
C304.4				3	3	2	1	3	3	3
C 304 TOTAL	04	03	03	07	12	03	06	12	12	12
CORRELATION LEVEL	1	1	1	2	3	1	1	3	3	3

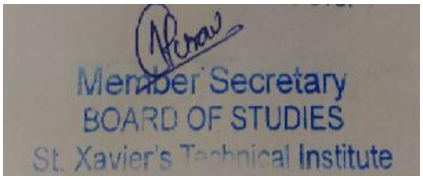
TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	06	9	12
CORRELATION LEVEL	1	2	3

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6	7, 8, 9	10, 11, 12
CORRELATION LEVEL	0	1	2	3

Mrs. Janani Natarajan

Subject Expert



Rubrics:

The marks distribution for allotting the **Project Term-Work** for the 5th semester is as follows:

Literature Survey C304.1	Synopsis C304.2	Attendance C304.3	Report C304.4	Total
15 marks	10 marks	10 marks	15 marks	50 marks

OBJECTIVES:
The students will be able to do the following in relation to the expected course outcomes specified in the table above,. It should be observed and evaluated by the concerned teacher/ guide whether the students do the following **during practical time, by also referring to the WEEKLY PROGRESS REPORT BOOK**:

- Apply previous knowledge gained in earlier semesters for project planning.
- Make logical decisions pertaining to requirements of project.
- Find effective solutions for problems arising at every stage of development of the project
- Work with confidence and in a timely manner.
- Work and interact together as a team with group members and also other groups.
- Solve problems faced during the design and building and testing phases of project.

The "WEEKLY PROGRESS REPORT BOOK/ LAB MANUAL" should also be referred to at the time of assessment and evaluation and granting of **TERM WORK**, to observe the student **commitment, interaction and activity, as stated in and related to the "Expected Course Outcomes" table above,**
The weekly progress report book used during the practical time allotted to students for the scheduled **PROJECT WORK** of 2 hours each, **should be checked and signed** by the concerned teacher/ guide.

The table to measure the attainment levels (on a rating scale of "out of 50') for the four criteria stated in the "rubrics" and the course outcome tables is as below

	COURSE OUTCOMES	C304.1 (out of 15)	C304.2 (out of 10)	C304.3 (out of 10)	C304.4 (out of 15)
STUDENT SPNO					
1303001					
1303002					
1303004					
1303005					
1303006					
1303008					
1303011					
…….					
…….					
……					

* The final % attainment level of course outcomes for the course, for term work may then be calculated.

Note: This course carries only term work marks out of 50. There is no oral exam. There is no practical exam.

CONTENTS

Sr. No.	Name of the Topic	Periods	Marks
1	Before finalizing the project they have to consider: - i) availability of components, parts required for the project. ii) total cost of the project. iii) approval for the project by the guide based on technical level and feasibility.	06	15
2	After finalizing the project they are supposed to do the following under the guidance of the guide:- i) purchasing of components, parts required for the project. ii) testing circuits part by part on a bread-board. iii) designing of art-work of PCB iv) making PCB by any suitable method. v) mounting and soldering of components. vi) testing the circuit fault finding if it is not working. vii) voltage and waveform analysis, calculations, plotting of graphs (if required) viii) mounting the circuit in a cabinet and mounting panel controls fuse meters etc.	12	20
3	All batches are supposed to prepare the Project report. The Project report must contain:- i) block diagram and working principle ii) working of the circuit with detailed circuit diagram iii) observations, graphs, calculations, results, applications iv) data sheets of active devices used. v) list of components and the total cost of the project	06	15

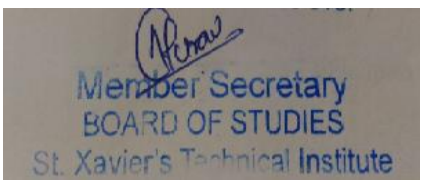
INSTRUCTIONS:

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			

Subject teacher will provide the details of references



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

Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory					
			L	P	Total	TH	TS	PR	OR	TW	Total
ET 18520	BASIC CONTROL SYSTEMS		4	2	6	80	20	**50**	-	25	175

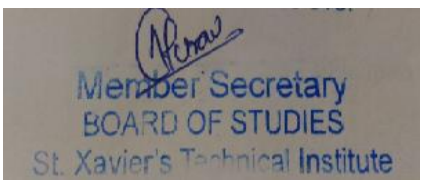
1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of PRACTICAL EXAM is Internal and External.
4) The assessment of Term-Work is Internal.

RATIONALE:

This subject is classified under the Applied Technology group and is introduced with a view that the students will be exposed to various types of control systems. More emphasis is given for understanding the basic concepts of control systems. Students are required to know the various components of a control system, basic concepts of stability, time domain and frequency domain characteristics, when they are working in process industries.

EXPECTED COURSE OUTCOMES

SEM V C305	BASIC CONTROL SYSTEMS (5^{TH} COURSE IN THIRD YEAR)
C305.1	Classify types of control system and construct transfer function of system
C305.2	Apply techniques for Block Diagram reduction and signal flow graph
C305.3	Analyse the behavior of the control system using standard test signals
C305.4	Examine the stability of the control system
C305.5	Inspect the stability of system using Root Locus and Bode Plot
C305.6	Demonstrate the Error Detection and Correction mechanism in control system



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

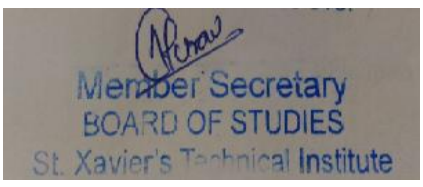
SEM V C305	BASIC CONTROL SYSTEMS (5TH COURSE IN THIRD YEAR) PREPARED BY : MM									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C305.1	2		2	1	2	1		1		2
C305.2	2	2	1	1		1		1		2
C305.3	1	1	3	2	1	1		1		1
C305.4	1	1			1	1				2
C305.5	1	2	2	2	1	1	1	1		2
C305.6	1	2	3	2	1	3	3	1		2
C 305 TOTAL	8	8	11	8	6	8	4	5	0	11
CORRELATION LEVEL	1	1	2	1	1	1	1	1	0	2

TABLE TO DECIDE CORRELATION LEVELS

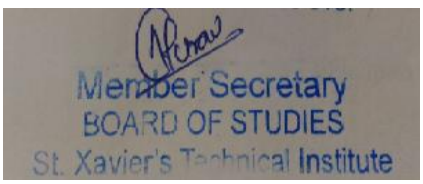
CO SUM TOTAL	06	12	18
CORRELATION LEVEL	1	2	3

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

Subject Expert
Mr. M. M. Munde



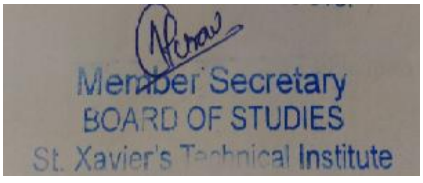
SECTION 1			
Sr. No.	Name of the Topic	Periods	Marks
01	**Introduction to control system & transfer 27unction 305.1 C305.2** 1.1 Historical background,Classification of systems, concept of feedback. Open loop and closed loop systems: examples, comparison, block diagram representation of Automatic control system, components, advantages and disadvantages. 1.2 Concepts of transfer function and properties. 1.3 Block diagram reduction techniques and problems. 1.4 Signal flow graph techniques and problems.	16	20
02	**Time domain Characteristics C305.3** 2.1 Standard test signals:Step, ramp, parabolic, impulse, mathematical and graphical representation, transfer function. 2.2 Time response of first order system: concept, response curve over step input, time constant. 2.3 Time response second order system: Brief concept of transient and steady state response, Response curve over unit step input, Performance characteristics: peak time, delay time, rise time, settling time, peak overshoot: definitions, formulae & significance, Characteristics equation, effect of damping factor. 2.4 Steady state error: definition, position, velocity, accelerations, constants, steady state error over step, ramp, parabolic input: formulae & problems.	16	20



SECTION 2			
Sr. No.	Name of the Topic	Periods	Marks
03	**Stability Concept C305.4** 3.1 Concept of stability. Necessary condition for stability. 3.2 Routh's stability criteria: Formation of Routh's array, condition for stable system, limitations, problems.	04	04
04	**Root locus Techniques C305.5** 4.1 Root locus concept. 4.2 Construction of root locus. 4.3 Problems based on the construction of root locus (simple problems: can be up to third order). 4.4 Condition of stability for root locus.	09	12
05	**Frequency domain analysis C305.5** 5.1 Frequency response: basic concept, frequency response curve Frequency response characteristics: resonance frequency, resonance peak, Bandwidth, phase and gain margin: definitions significance. 5.2 Bode plot: Basic concept, procedure, magnitude and phase plot for different standard functions, simple problems, condition for stability.	10	12
06	**System Components C305.6** 6.1 Potentiometers: Types, characteristics, construction, sensitivity. Servo Mechanism, Servo-potentiometers. Potentiometer as a error detector, transfer function, advantages, application. 6.2 Servo amplifiers: Diagram, working, applications. 6.3 Compensator: basic concept of lead and lag compensator (No Problems). 6.4Synchro Transmitters and Receivers.	09	12

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	**To obtain a transfer function from given poles and zeros using Matlab**	C305.1
2	**To obtain transfer function of a given system using block reduction techniques**	C305.2
3	Study of Test Signal Generator	C305.3
4	Study and plot the graph of Type'0' and Type'1' control system	C305.3
5	Study and plot the graph of Type'2' control system	C305.3
6	Plot the linearity curve of potentiometer error detector	C305.6
7	Determine gain of potentiometer error detector	C305.6
8	Study the A.C. Detector and to observe the phase reversal of error signal	C305.6
9	Synchro transmitter and receiver system as an indicating system	C305.6
10	Plot the stator voltages and find the phase difference between them	C305.6
11	Study the effect of Reversing the rotor supply to the synchro transmitter Interchanging the stator winding S1 and S3 of synchro receiver Interchanging the stator winding of synchro receiver in cyclic order	C305.6
12	Study the stepper motor and observe the forward reverse direction movement of stepper motor	C305.6
13	Feedback encoder and decoder in servo motor closed loop operation.	C305.6
14	Practicals using MATLAB software: Plot all standard signals Plot of Root locus Plot of Bode plot	C305.5
15	Plot the frequency response of control system	C305.5



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	Introduction to control system & transfer function	16	2	8	10	20
2	Time domain Characteristics	16	2	6	12	20
Section II						
3	Stability Concept	4	0	2	2	4
4	Root locus Techniques	9	2	2	8	12
5	Frequency domain analysis	10	2	2	8	12
6	System Components	9	2	4	6	12
Total		64	10	24	46	80

IMPLEMENTATION STRATEGY

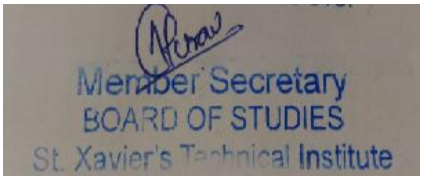
1. Teaching plan
2. Minimum 10 practicals / assignments
3. Industry visit.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	I. J. Nagrath and M. Gopal	Control System Engineering	5th	2008	Newage International Pvt. Ltd.
2.	K. Tandan, A. Subba Rao, Parag Desai, S. K. Kulkarni,	Control Engineering	2nd		Dhanpat Rai Sons.
3.	Curtis D. Johnson	Process Control Instrumentation Technology	7th		PHI

E- REFERENCES

http://www.eng-tips.com
http://control.com/
http://consys.forum.mst.edu/
https://automationforum.in/



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

Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 18516	VOCATIONAL TRAINING **(No Theory exam)**	All subjects	-	4 + 2 *	6	-	-	-	50	50	100

1) The assessment of Report / Certification of **Training done in industry** is Internal and External.
2) Assessment of Term Work / Presentation is Internal.

*** 2 credits for actual vocational training in industry**

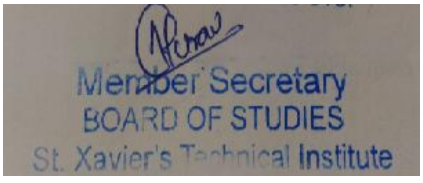
RATIONALE:

It is of utmost importance that the student gets exposure to the environment and working conditions in industry. This subject is classified under the Applied Technology category. It is of utmost importance that the student gets exposure to the environment and working conditions in industry. For this purpose, the Institute has introduced the mandatory vocational training programme of 4 to 6 weeks, for all the students, after the fourth semester examinations (during vacation period). The students are placed in various industries / companies in various departments where they are exposed to actual work environment, enabling them to learn various aspects of the functioning of the industry as well as interacting and communicating with people associated with the industry. The objective of this vocational training programme is to instill confidence among students and build their personality, as well as gain work experience in a real-time industry environment.

This Vocational Training programme has a total weightage of **four credits**, and the assessment is based on the performance of the student, other traits like punctuality and attendance, and also feedback from the industry as well as the report submitted by the student. This assessment of term work / presentation is internal.

COURSE OUTCOMES & CO PO MAPPING

SEM V C 306	VOCATIONAL TRAINING (6 TH COURSE IN THIRD YEAR)
C306.1	Enable to learn various aspects of the functioning of the industry
C306.2	Enable to interact and communicate with people associated with the industry
C306.3	Develop confidence among students
C306.4	Build personality among students
C306.5	Gain work experience in a real-time industry environment
C306.6	Expose to the environment and working conditions in industry



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

SEM V C 306	VOCATIONAL TRAINING (6 TH COURSE IN THIRD YEAR)									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C306.1					3	3	3		3	3
C306.2					3	3	3		3	3
C306.3					3	3	3		3	3
C306.4					3	3	3		3	3
C306.5					3	3	3		3	3
C306.6					3	3	3		3	3
C 306 TOTAL	00	00	00	00	18	18	18	00	18	18
CORRELATION LEVEL	0	0	0	0	3	3	3	0	3	3

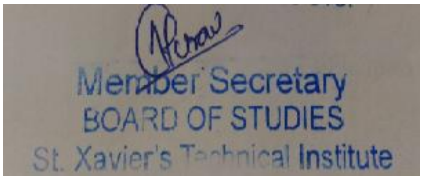
TABLE TO DECIDE CORRELATION LEVELS

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. K. H. Kamath

Subject Expert



Note:

1) The marks for the **PRACTICALS** component **(out of 50)** will be based on the feedback and assessment of student performance/ certificate received from the respective industry/ company and the submitted report prepared by the student, AND ALSO with reference to the above expected course outcomes.

2) The marks for the **TERM WORK** component **(out of 50)** will be based on the submitted reports, presentations, and oral discussion with the concerned teacher pertaining to work done in industry, AND ALSO with reference to the above expected course outcomes.

The table for measurement of the % attainment levels of the course outcomes for **TERM WORK** as well as **PRACTICAL** is as shown below:

	COURSE OUTCOMES	C306.1 (out of 50)	C306.2 (out of 50)	C306.3 (out of 50)	C306.4 (out of 50)	C306.5 (out of 50)	C306.6 (out of 50)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
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* The final average % attainment level of course outcomes for the course, for term work may then be calculated.

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

Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 18517	CIRCUIT SIMULATION AND PCB DESIGN		-	2	2	-	-	50		25	75

1) The assessment of Term-Work is Internal.
2) Assessment of practicals is Internal and External.

RATIONALE:

This subject which comes under the Applied Technology group will enable the students to compare the performance of simulated circuits and physical circuits with components mounted on a printed circuit board. The laboratory experiences also provide an opportunity to students to design printed circuit boards after verification of the performance of the designed circuit through simulation using the "Eagle" circuit simulation and design software. This knowledge builds a strong foundation for further development of their project work in the final year.

COURSE OUTCOMES & CO PO MAPPING

SEM V C 307	CIRCUIT SIMULATION AND PCB DESIGN (7 TH COURSE IN THIRD YEAR)
C307.1	Verify performance of the designed circuit through simulation using the "Ni MultiSim" circuit simulation software.
C307.2	Design printed circuit board after verification of the circuit on simulation.
C307.3	Design the tested printed circuit board in "Eagle Cad" software.
C307.4	Develop PCB for various electronic circuits.
C307.5	Develop Tinning and soldering skills.
C307.6	Compare the performance of the simulated circuit and physical circuit with components mounted on a printed circuit board.

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

SEM V C 307	CIRCUIT SIMULATION AND PCB DESIGN (7 TH COURSE IN THIRD YEAR) PREPARED BY : SD'									
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C307.1	3	3	3	3				3		3
C307.2	3	3	3	3				3		3
C307.3	3	3	3	3				3		3
C307.4	3	3	3	3				3		3
C307.5	3	3	3	3				3		3
C307.6	3	3	3	3				3		3
C 307 TOTAL	18	18	18	18	00	00	00	18	00	18
CORRELATION LEVEL	3	3	3	3	0	0	0	3	0	3

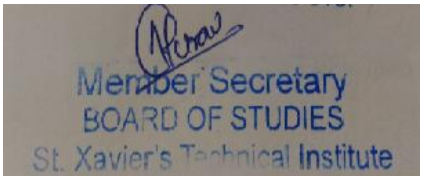
TABLE TO DECIDE CORRELATION LEVELS

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. Stevenson D'souza

Subject Expert



The laboratory experiences for the subject of Circuit Simulation and **PCB Design** in the **Fifth Semester**, which carries 2 credits, may be modified, new practical experiences introduced **in relation to the newly installed automated PCB fabricating equipment** and its relevant user/ training manual. Such a list of practical experiences will be implemented by the concerned staff member conducting these practicals.

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1.	Introduction and Need of CSPCB	-
2.	Introduction to Multisim Software.	**C307.1**
3.	Simulating the Schematic Diagram in Multisim Software	**C307.2**
4.	Introduction to Eagle Cad Software.	**C307.3**
5.	Designing a PCB using Schematic Diagram.	**C307.3**
6.	Designing a PCB using Board Diagram	**C307.4**
7.	Generating PCB Art-Work, 1. Gerber data (For CNC Machine, Milling and Drilling) , 2. Photo Resist Method 3. Ironing Method	**C307.4**
8.	Developing a PCB from designed Art-Work using CNC Machine	**C307.4**
9.	Developing a PCB from designed Art-Work using Photo resist Method	**C307.4**
10.	Developing a PCB from designed Art-Work Ironing Method.	**C307.4**
11.	Tinning and Soldering the PCB	**C307.5**
12.	Testing the Output of PCB and comparing with Simulated Output.	**C307.6**

The software to be used for simulation is PSPICE and CIRCUIT MAKER.

The list of the laboratory experiences stated above also carry reference to the table shown below:

PCB DESIGN:

1.	Selection of any one circuit with minimum 3 to 4 different ICs.
2.	Simulation of the circuit using PSPICE or CIRCUITMAKER and store the results.
3.	Design of PCB layout.
4.	Making of PCB.
5.	Mounting the components physically according to the circuit and soldering them.
6.	Obtain the results of the above assembled circuit and compare with the simulated results.
7.	Soldering and De-soldering practice.

IMPLEMENTATION STRATEGY

1.Teaching plan
2.Minimum 10 practicals

References:

1. Printed Circuit Boards, Design and Technology, Walter Bosshart.
2. Printed Circuits Handbook, Edited by Clyde f. Coombs, Jr.
3. Printed Circuit Board Assembly, P.J.W. Noble.

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	C307.1 (out of 25)	C307.1 (out of 25)	C307.2 (out of 25)	C307.3 (out of 25)	C307.3 (out of 25)	C307.4 (out of 25)
STUDENT SPNO							
1303001							
1303002							
1303004							
1303005							
1303006							
1303008							
1303011							
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* 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	C307.1 (out of 50)	C307.1 (out of 50)	C307.2 (out of 50)	C307.3 (out of 50)	C307.3 (out of 50)	C307.4 (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.

PROGRAMME TITLE : Diploma in Electronics & Telecomm. Engineering
SEMESTER : Five

Course Code	Course Title	Prerequisite	Credits			Examination Scheme					
						Theory		PR	OR	TW	Total
			L	P	Total	TH	TS				
ET 18518	PLC SYSTEMS AND APPLICATIONS (Elective 1)		**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 Exam is Internal and External.

RATIONALE:

The subject is classified under Applied Technology group. An example of application of this subject would be the automobile industry, in applications such as pick and place, welding, spray painting etc. The objective of this subject is to teach the student different systems used in various industries universally through Programmable Logic Control (PLC) Systems. The subject introduces the common industrial control system elements including programmable logic controller, PC based control and process monitoring. This subject is a multi disciplinary subject.

EXPECTED COURSE OUTCOMES

SEM V C308	PLC SYSTEMS AND APPLICATIONS (8 TH - ELECTIVE COURSE IN THIRD YEAR)
C308.1	Analyze the need and applications of automation
C308.2	Classify PLCs and identify their characteristics
C308.3	Configure a PLC hardware system
C308.4	Develop PLC programming by using various PLC functions like ladder logic.
C308.5	Program and Interface HMI Panels to PLC
C308.6	Establish communication between PLC & SCADA

OBJECTIVES:

The student will be able to:
1. Know the new advanced systems used in Industrial as well as at domestic levels.
2. Identify different systems in Industrial Automation.
3. Know the ladder language programming for PLC.
4. Know the programming for HMI panel.
5. Know the programming for SCADA.

SECTION 1			
Sr. No.	Name of the Topic	Periods	Marks
1	**Basics of automation C308.1** 1.1 Need of automation 1.2 Benefits of automation 1.3 Application areas – Process industries, Buildings, Robotics, Infrastructure, Aerospace, railways, Automobiles, Telecom, Electrical distribution, Medical	08	10
2	**PLC Basics C308.2** 2.1 Evolution and Role of PLC in Automation 2.2 Block Diagram & Principle of Working 2.3 PLC Classification based on Type and Size 2.4 PLC Characteristics – CPU, Racks, Power Supply, Memory, Input & Output Modules, Application Specific Modules, Speed of Execution, Communication, Redundancy.	16	20
3	**PLC Hardware C308.3** 3.1 Description and Function of various PLC Modules 3.2 PLC Hardware Configuration 3.2.1 Addressing of PLC I/O 3.2.2 Diagnostic Features	08	10
SECTION 2			
4	**PLC Programming C308.4** 4.1 Definition and Use of Bits and Words 4.1.1 Introduction to PLC Programming Languages – Ladder, Instruction List, Structured Text, Grafcet 4.1.2 PLC Programming Software, its installation and use with a PC 4.1.3 Instruction Set in Ladder – NO, NC, Set, Reset, Timers, Counters, Comparison, Arithmetic, Logical, Move, Drum Controller 4.1.4 Programming Examples in Ladder with simple applications	16	20
5	**HMI: Local Operator Panels C308.5** 5.1 Need for HMI 5.2 Types and Characteristics of Local HMIoperator panels 5.2.1 Introduction to Programming of HMI Panels 5.2.2 Interface between HMI Panels and PLC	08	10

6	**HMI: SCADA C3108.6** 6.1 Definition of SCADA 6.1.1 Functional Block Diagram 6.1.2 Function of SCADA 6.1.3 Communication between PLC and SCADA 6.2 SCADA Applications	08	10

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1	Use of simulation package for different function	**C308.4**
2	Verify function of logic gates by using PLC	**C308.4**
3	Write and verify ladder program for motor ON-OFF Control with two push button	**C308.4**
4	Write and verify the ladder program for analog input (temp.) Measurement	**C308.4**
5	Develop a graphical screen for SCADA based system	**C308.6**
6	Perform the frequency measurement by using high speed counter in PLC	**C308.4**
7		
8		
9		
10		
11		
12		
13		

A) Practical Training:

Skills to be developed:

Intellectual Skills:

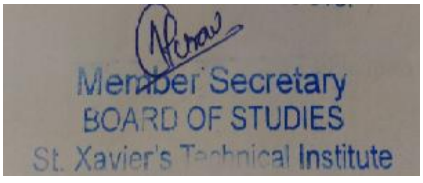
i) Logical thinking.

ii) Software development.

iii) Programming using ladder language.

Motor Skill:

i) Observational Skills



B) Field Work:

Case study of typical PLC systems like Siemens, Allen Bradley, Schneider, Messung, etc. and comparison of the specification and cost.

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	Basics of automation	08	06	04	--	10
2	PLC Basics	16	08	08	04	20
3	PLC Hardware	08	06	04	--	10
Section II						
4	PLC Programming	16	08	08	04	20
5	HMI: Local Operator Panels	08	06	04	--	10
6	HMI: SCADA	08	06	04	--	10
Total		64	40	32	08	80

IMPLEMENTATION STRATEGY

The **TERM WORK** marks **(out of 25)** are based on reports/ presentations made by training and practice sessions experienced during the external training programmes of the subject in different industries/ institutes/ case studies of different equipment.

The **ORAL EXAM** marks **(out of 50)/** assessment is internal and external which carries 50 marks.

REFERENCES :

Sr. No	Name of Book	Author	Publication
1	Programmable Logic control- Principles and applications	NIIT	Prentice Hall India
2	Introduction to Programmable Logic Controllers	Grag Dunming	Thomson
3	Programmable logic controllers and Industrial automation	Madhuchand A Mitra & Samarjit Sen Gupta	Penram International
4	Process Control Instrumentation Technology	C D Johnson	Prentice Hall India
5	Programmable Logic Controller	Petruzella	McGraw Hill

E-REFERENCES

http://www.eng-tips.com
http://control.com/
https://automationforum.in/
https://www.tutorialspoint.com/