



**ST. Xavier's Technical Institute,
Mahim, Mumbai 400 016**

**Revised Curriculum
For
Diploma Programme in
Electronics and
Telecommunication
Engineering**

From July 2024

A.Y.2024-25



ST. Xavier's Technical Institute, Mahim, Mumbai 400 016
Diploma Programme in Electronics and Telecommunication Engineering
Programme Structure

Programme Educational Objectives (PEO)

(What the student will continue to do even after 3-5 years of working in the industry)

PEO1: To produce diploma holders who have the ability to demonstrate technical competence in the fields of Electronics and Telecommunication engineering and develop solutions to the problems.

PEO2: To produce diploma holders who would be able to take individual responsibility and to work as a part of a team towards the fulfillment of both individual and organizational goals.

PEO3: To prepare the students to engage in professional development through self-study, graduate and professional studies in engineering, management and research.

Program Outcomes (PO) given by NBA.

(What the student will be able to do at the entry point of industry soon after diploma programme)

PROGRAM OUTCOMES (POs)

1. **Basic and Discipline specific knowledge:** Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis:** Identify and analyse well-defined engineering problems using codified standard methods.
3. **Design/ development of solutions:** Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. **Engineering Tools, Experimentation and Testing:** Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society, sustainability and environment:** Apply appropriate technology in context of society, sustainability, environment and ethical practices.
6. **Project Management:** Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
7. **Life-long learning:** Ability to analyse individual needs and engage in updating in the context of technological changes.

Note for All the Semesters :

1. Every student has to pass in each head of End-Semester-Examination (ESE) i.e Theory, Practical, Term work by securing minimum of 40% marks of the maximum marks i.e. ::--
 - For Theory (ESE) ::--- 28 out of 70 marks
 - For Theory (ESE) ::--- 32 out of 80 marks
 - For Practical (ESE) ::--- 20 out of 50 marks
 - For Term work ::--- 10 out of 25 marks
 - For Term work ::--- 20 out of 50 marks
2. Progressive Assessment (PA) for Theory includes – average of two PTs of 20 marks each. Progressive Assessment (PA) for Practical includes lab performance , Assignment/Quiz/Presentations & attendance ,Also 10 marks for micro projects as per the course. The scheme and schedule for progressive assessment should be informed to the students and discussed with them at the start of the term.
3. For developing self-directed learning skills, from each course about 15-20% of the topics/sub-topics, which are relatively simpler or descriptive in nature are to be given to the students for self-study , proper learning of these topics should be assured by Assignment/Quiz/conducting classroom presentations of students by respective faculty.



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

TEACHING AND EXAMINATION SCHEME

REVISED AND EFFECTIVE
FROM JULY 2024

Program Name ::--- **Electronics & Telecommunication Engineering**

SEMESTER ::--- **FIVE**

Duration ::--- **16 weeks**

ACADEMIC YEAR - 2024-25

TEACHING SCHEME

EXAMINATION SCHEME

SR.NO	COURSE TITLE	COURSE CODE	L	T	P	CREDITS	Exam Duration in Hrs	THEORY						PRACTICAL						GRAND TOTAL
								ESE		PA		TOTAL		ESE		PA		TOTAL		
								Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	
1	Control System	ETES 501	03	00	02	4	3	70	28	30#	00	100	40	50	20	25	10	75	30	175
2	Satellite & Mobile Communication	ETPC 502	03	00	02	4	3	70	28	30#	00	100	40	50	20	25	10	75	30	175
3	Microwave & Fiber Optic Communication	ETPC 503	03	00	02	4	3	70	28	30#	00	100	40	50	20	25	10	75	30	175
4	Data Communication & Computer Networking	ETPC 504	03	00	02	4	3	70	28	30#	00	100	40	50	20	25	10	75	30	175
5	Industrial Managment	ETES 505	03	00	00	3	3	70	28	30#	00	100	40	----	----	—	—	—	—	100
6	Capston Project	ETOE 506	00	00	02	1	—	----	----	----	----	----	----	50	20	50	20	100	40	100
TOTAL			15	00	10	20		350		150		500		250		150		400		900

Total No. of Credits = **20** Total No. of Student Contact Hours = **25 Hrs.**

Total Marks **900**

Theory and Practical periods of 60 minutes each.

Medium of Instruction ::--- **English**

Abbreviations	TH	Theory	ESE	End Semester Exam		----	Not Applicable	
	TU	Tutorial	PA	Progressive Assessment		*	Online Examination	

Progressive Assessment # (PA) for Theory includes – out of 30 marks, 20 marks is average of 2 periodical tests (PT) and 10 marks are for micro project assessment.

Progressive Assessment (PA) for Practical includes lab performance , micro projects, Assignment/Quiz/Presentations & attendance as per the course

Program Title				Diploma in Electronics & Telecommunication Engineering								
Course Code	ETES 501	Course Title		CONTROL SYSTEMS							Semester	5
Teaching Scheme				Examination Scheme								
Credits				Theory			Practical	Oral	Online	Term work	Total	
Lecture	Tutorial	Practical	Total	ESE	PA	Total						
3	-----	2	4	70	30#	100	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) #Progressive Assessment out of 30 marks , 20 marks is average of 2 periodical tests (PT) and 10 marks are for micro project assessment.											

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.

COURSE OUTCOMES:--

Semester	5	Subject	CONTROL SYSTEMS
C0501		1 st Course in Third Year	
CO 501.1		Classify types of control system, list examples of control system & applications.	
CO 501.2		Apply techniques for Block Diagram reduction and signal flow graph	
CO 501.3		Analyse the behavior of the control system using standard test signals	
CO 501.4		Examine the stability of the control system	
CO 501.5		Inspect the stability of system using Root Locus and Bode Plot	
CO 501.6		Demonstrate the Error Detection and Correction mechanism in control system	

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

SEM V	CONTROL SYSTEMS (1st course in Third Year)						
	PREPARED BY: RS						
CO	P01	P02	P03	P04	P05	P06	P07
CO 501.1	2		2	1	2	1	1
CO 501.2	2	2	1	1		1	
CO 501.3	1	1	3	2	1	1	
CO 501.4	1	1			1	1	
CO 501.5	1	2	2	2	1	1	
CO 501.6	1	2	3	2	1	3	3
CO TOTAL	8	8	11	8	6	8	4
CORRELATION LEVEL	1	1	2	1	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. Rakeshkumar Saroj

	Section -- 1						
Chapter No	Topics	Periods	Marks				COs
		Hrs.	R	U	A	Total	
1	FUNDAMENTAL TO CONTROL SYSTEM						
	1.1 Introduction 1.2 Classification of systems 1.3 Concept of feedback, Types of feedback 1.4 Open loop and closed loop systems with examples, comparison, advantages and disadvantages.	03	03	--	--	03	CO 501.1
2	MODELLING A CONTROL SYSTEM - TRANSFER FUNCTION, BLOCK DIAGRAM REPRESENTATION, SIGNAL FLOW GRAPH APPROACH						
	2.1 Concepts of transfer function and problems. 2.2 Concept of poles, zeros, characteristic equation pole-zero plot and problems. 2.3 Rules of Block diagram reduction techniques and problems. 2.4 Concept of Signal flow graph technique and its related problems. (No numericals/problems on conversion of block diagram to signal flow graph)	10	03	05	08	16	CO 501.2
3	TIME DOMAIN STABILITY ANALYSIS						
	3.1 Standard test signals: Step, ramp, parabolic, impulse, mathematical and graphical representation of test signals. 3.2 Classification of control system according to "TYPE" of systems, steady state errors, static error co-efficient, steady state analysis of different types of systems using step, ramp and parabolic input signals. 3.3 Time response of first and second order systems with standard input signals. 3.4 Performance characteristics: peak time, delay time, rise time, settling time, peak overshoot definitions, formulae (no derivations), effect of damping factor, numerical problems associated with time response specifications.	11	03	05	08	16	CO 501.3

Section -- 2							
Chapter No.	Topics	Periods	Marks				COs
		Hrs.	R	U	A	Total	
4	STABILITY CONCEPT						
	4.1 Concept of stability. Necessary condition for stability. 4.2 Routh Hurwitz criteria, Routh's stability criteria: Formation of Routh's array, condition for stable system, limitations, problems.	6	--	3	5	08	CO 501.4
5	ROOT LOCUS TECHNIQUES						
	5.1 Root locus concept. 5.2 Construction of root locus. 5.3 Problems based on the construction of root locus (simple problems: can be up to third order). 5.4 Condition of stability for root locus.	7	3	3	5	11	CO 501.5
6	FREQUENCY DOMAIN ANALYSIS						
	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.	7	--	5	5	10	CO 501.5
7	SYSTEM COMPONENTS						
	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). 6.4 Synchro Transmitters and Receivers.	4	3	3	--	06	CO 501.6

IMPLEMENTATION STRATEGY:

- 1) Use of PowerPoint presentations and Videos
- 2) References from the internet (**for teachers as well as students**)
- 3) Extensive use of examples
- 4) Group discussions and micro project

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE CHAPT.	NO.
		OUTCOME	
1	To obtain poles and zeros from a given transfer function	C501.2	2
2	To obtain transfer function of a given system using block reduction techniques	C501.2	2
3	Study of Test Signal Generator	C501.3	3
4	Study and plot the graph of Type'0' control system	C501.3	3
5	Study and plot the graph of Type'1' control system	C501.3	3
6	Study and plot the graph of Type'2' control system	C501.3	3
7	Plot the linearity curve of potentiometer error detector	C501.6	7
8	Determine gain of potentiometer error detector	C501.6	7
9	To Determine Step and Impulse Response for a First Order Unity Feedback System.	C501.3	3
10	Study of Synchro transmitter and receiver system as an indicating system.	C501.6	7
11	To plot root locus for a given transfer function using matlab	C501.5	5
12	To plot bode plot for a given transfer function using matlab	C501.5	6

IMPLEMENTATION STRATEGY

- Teaching plan
- Minimum 10 practicals

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	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)
STUDENT SPNO							
1303001							
1303002							
1303004							

*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 LIST OF MICROPROJECTS

Sr. NO.	TITLE
1	Case studies on any topic related to the course
2	Assignments / Tutorials.
3	Springboard training workshops
4	3D models / charts related to the course

Micro project could be group based. A suggestive list is given here, similar micro projects could be added by concerned faculty. Each student will maintain dated work diary with details of individual contribution. Assessment is done by project guide based on their performance and presentation of submission.

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	2	3	--	--	3
2	TIME DOMAIN STABILITY ANALYSIS CHARACTERISTICS	10	3	5	8	16
3	MODELLING A CONTROL SYSTEM	11	3	5	8	16
Section II						
4	STABILITY CONCEPT	6	--	3	5	8
5	ROOT LOCUS TECHNIQUES	7	3	3	5	11
6	FREQUENCY DOMAIN ANALYSIS	7	--	5	5	10
7	SYSTEM COMPONENTS	4	3	3	--	6
Total		48	15	24	31	70

REFERENCES

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

WEBREFERNCES / E- REFERENCES :

<https://www.electrical4u.com/control-engineering>
<https://controlsystem.co.in/>
<https://nptel.ac.in>
<https://swayam.gov.in>

Program Title				Diploma in Electronics & Telecommunication Engineering							
Course Code	ETPC 502		Course Title	SATELLITE & MOBILE COMMUNICATION						Semester	5
Teaching Scheme				Examination Scheme							
Credits				Theory			Practical	Oral	Online	Term work	Total
Lecture	Tutorial	Practical	Total	ESE	PA	Total					
3	-----	2	4	70	30#	100	50	-----	-----	25	175
	1) Theory paper duration 3hrs. 2) Theory paper assessment is Internal and External. 3) The assessment of practical is Internal and External. 4) # Progressive Assessment out of 30 marks , 20 marks is average of 2 periodical tests(PT)and10marks are for micro project assessment.										

RATIONALE:

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 and mobile wireless technologies have become major information transmission systems. The glorious 21st century marks the growth of the mobile radio communication industry by orders of magnitude. 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 different 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 satellite and mobile wireless communication systems.

COURSE OUTCOMES: --

Course theory content, practical skills, experience help student to understand basic terms, functions & uses of Microwave and Fiber Optic Communication, thus student should able to

Semester	5	Subject	SATELLITE & MOBILE COMMUNICATION
C0502		2 nd Course in Third Year	
C0502.1		Distinguish various elements of satellite communication system and compare the various frequency bands allotted for SATCOM	
C0502.2		Classify satellite orbits and analyze the significance of their design parameters in the operation of satellites.	
C0502.3		Illustrate the working principle of Earth station transmitter receiver and satellite transponder	
C0502.4		Distinguish various elements and interpret their significance in the operation of Mobile communication system.	
C0502.5		Appraise the cellular concept and mobile unit.	
C0502.6		Appreciate the evolution of technology through various mobile generations from 2G to 6G.	

Mapping of Course outcomes(Cos) to Program outcomes(Pos)

SEM V	SATELLITE & MOBILE COMMUNICATION							
CO502	(2 nd Course in Third Year) PREPARED BY: Dr. JN							
	P01	P02	P03	P04	P05	P06	P07	
CO502.1	3	2	1	2	1	1	3	
CO502.2	3	2	2	3	1	1	3	
CO502.3	3	2	2	3	1	1	3	
CO502.4	3	3	2	1	1	3	3	
CO502.5	3	3	2	2	1	3	3	
CO502.6	3	3	2	2	1	3	3	
CO TOTAL	18	15	11	13	06	12	18	
CORRELATION LEVEL	3	3	2	2	1	2	3	

TABLE TO DECIDE CORRELATION LEVELS

COSUM TOTAL	06	12	18
CORRELATION LEVEL	1	2	3

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

Subject Expert :

Dr. Janani Natarajan

	Section—1						
Chapter No	Topics	Periods	Marks				Cos
		Hrs.	R	U	A	Total	
1	INTRODUCTION TO SATCOM SYSTEM						
	1.1 Definitions – Repeater, transponder, uplink, downlink, earthstation, satellite system, Payload, Bus. 1.2 Basic block diagram of SATCOM System. 1.3 SATCOM frequency bands 6/4 Ghz (C Band) 14/12 Ghz (Ku Band) 30/20 Ghz (Ka Band). Comparison. 1.4 Advantages, Disadvantages and Applications of SATCOM Systems.	08	05	08	-	13	CO 502.1
2	SATELLITE ORBITS						
	2.1 Definitions – orbit, apogee, perigee, line of Apisides, ascending node, descending node, line of nodes, angle of inclination, prograde and retrograde orbit. 2.2 Types of orbits – Equatorial orbit, Polar orbit, Inclined Orbit, Geostationary orbit; LEO, MEO, HEO 2.3 Geostationary orbit: features, advantages and disadvantages. 2.4 Orbital adjustments: 2.4.1 orbital spacing 2.4.2 Station keeping 2.4.3 Satellite stabilization or Attitude Control	12	05	08	03	16	CO 502.2
3.	EARTH STATION & SATELLITE TRANSPONDER						
	3.1 Block diagram of earth station transmitter (C-Band up converter) and Earth station receiver (C-Band down converter). 3.2 Block Diagram of 6/4 GHz (C - band) transponder.	04	03	03	-	06	CO 502.3

	Section--2						
Chapter No.	Topics	Periods	Marks				COs
		Hrs.	R	U	A	Total	
4	INTRODUCTION TO MOBILE COMMUNICATION SYSTEM						
	4.1 Evolution of mobile radio communication 4.2. Related definitions- base station, control channel, forward channel, reverse channel, mobile station, mobile switching center, handoff, subscriber, transceiver, roamer. 4.3 How cellular telephone call is made. 4.4 Block Diagram and operation of mobile unit, transmitter, receiver, logic unit, control unit & handset	04	03	02	-	05	CO 502.4
5	THE CELLULAR CONCEPT						
	5.1 Introduction to basic cellular system. 5.2 Frequency reuse. 5.3 Hand off, Types - hard hand off, soft handoff, delayed and queued hand off. 5.4 Interference & system capacity. 5.5 Co channel interference & system capacity. 5.6 Adjacent channel Interference. 5.7 Power control for reducing interference. 5.8 Improving coverage and capacity in cellular system – 5.8.1 Cell splitting 5.8.2 Sectoring 5.8.3 Repeater for range extension 5.8.4 Micro cell zone concept.	10	02	08	05	15	CO 502.5
6	EVOLUTION OF MOBILE TECHNOLOGIES						
	6.1 2G and 3G technologies 6.1.1 GSM Network Architecture, air interface specifications, GSM Call and handoff procedures in GSM. 6.1.2 IS-95: CDMA air interface, CDMA channels, power control in CDMA system, handoff, and RAKE receiver. 6.2 Advanced Techniques For 4G, 5G and B5G 6.2.1 3GPP LTE - Introduction, system overview: Frequency bands and spectrum flexibility, network structure, protocol structure.	10	02	08	05	15	CO 502.6

	6.2.2 Multi-antenna Techniques: Smart antennas, Multiple input Multiple output systems. 6.2.3 Introduction to 5G network and technologies used in 5G - small cell concept, Massive MIMO, Beamforming, NOMA, and mm wave.						
--	---	--	--	--	--	--	--

IMPLEMENTATION STRATEGY:

- 1) Use of Power Point presentations and Videos
- 2) References from the internet **(for teachers as well as students)**
- 3) Extensive use of examples
- 4) Group discussions and micro project
- 5) Assignments for writing skills, create awareness about selection /purchasing components

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME	CHAPT. NO.
1	Direct Link Between Uplink Transmitter & Downlink Receiver.	C 502.1	1
2	Link Fail Operation Between Transmitter & Receiver	C 502.3	3
3	Voice signal and Function Generator Waveform Transmission through Satellite link.	C 502.3	3
4	Telemetry, Light Intensity & Temperature.	C 502.2	2
5	Calculate co-channels and cell clusters in a cellular network.	C 502.5	5
6	Frequency Reuse in Cellular Systems.	C 502.5	5
7	Study of Mobility Management (Hand over).	C 502.4	4
8	Measurement of Power Consumption of mobile devices during different communication activities (e.g., voice calls, data transfer, standby mode).	C 502.5	5
9	Measurement of Signal Strength.	C 502.5	5
10	Evaluation of mobile network performance metrics - throughput, latency, and packet loss.	C 502.5	5
11	Analysis of interference mobile communication systems - adjacent channel interference, co-channel interference, and inter-symbol interference.	C 502.5	5
12	Evaluation of Quality of Service (QoS)	C 502.5	5

IMPLEMENTATION STRATEGY

1. Teaching plan
2. Minimum 10 practicals

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	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)
STUDENT SPNO							
1303001							
1303002							
1303004							

* 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 LIST OF MICROPROJECTS

Micro project could be group based. A suggestive list is given here. Similar micro projects could be added by concerned faculty. Each student will maintain dated work diary with details of individual contribution. Assessment is done by concerned faculty based on their performance and presentation of submission.

1. **Market Analysis for Satellite Communication Hardware:** Conduct a market analysis to evaluate the demand for satellite communication hardware, such as antennas, modems, and ground station equipment. Identify key market players, technological advancements, pricing trends, and emerging opportunities. Present the findings in a comprehensive report with recommendations for stakeholders in the satellite communication industry.
2. **Report on Satellite Communication Standards and Regulations:** Research and compile a report on the current standards and regulations governing satellite communication systems. Cover topics such as frequency allocation, licensing requirements, spectrum management, and international agreements. Analyze the impact of regulatory frameworks on the development and deployment of satellite communication technologies.
3. **Prototype Model of a Satellite Communication Relay Station:** Develop a prototype model of a satellite communication relay station capable of providing coverage to remote or disaster-stricken areas. Design the relay station to be portable, easy to deploy, and interoperable with existing satellite networks. Test the prototype in simulated field conditions to assess its performance and practicality.
4. **Report on Emerging Trends in Satellite Communication:** Research and analyze emerging trends in satellite communication technologies, applications, and market dynamics. Explore topics such as small satellite constellations, high-throughput satellites, software-defined payloads, and satellite-based IoT networks. Summarize your findings in a detailed report highlighting opportunities for innovation and investment in the satellite communication sector.

5. **Prototype Model of a Low-Cost Mobile Phone:** Design and build a prototype model of a low-cost mobile phone targeting price-sensitive markets or budget-conscious consumers. Incorporate essential features such as voice calling, text messaging, and basic internet connectivity while minimizing manufacturing costs.
6. **Market Analysis for Mobile Device Accessories:** Conduct a market analysis to assess the demand for mobile device accessories such as cases, chargers, headphones, and screen protectors. Identify key market trends, competitive landscape, distribution channels, and consumer preferences. Present the findings in a detailed report with recommendations for manufacturers, retailers, and distributors in the mobile accessories market.
7. **Prototype Model of a Mobile Network Infrastructure:** Develop a prototype model of a mobile network infrastructure comprising base stations, antennas, and backhaul links. Design the infrastructure to support various mobile technologies and network architectures, such as standalone and non-standalone 5G, LTE, and Wi-Fi.
8. **Prototype Model of a Mobile Communication App:** Design and develop a prototype model of a mobile communication app tailored for specific use cases, such as messaging, voice calling, video conferencing, or social networking. Incorporate features such as end-to-end encryption, multi-platform compatibility, and intuitive user interface design.

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 SATCOM SYSTEM	08	08	05	---	13
2	SATELLITE ORBITS	12	03	08	05	16
3	EARTH STATION AND SATELLITE TRANSPONDER	04	03	03	---	06
	Section II					
4	INTRODUCTION TO MOBILE COMMUNICATION SYSTEM	04	03	02	---	05
5	THE CELLULAR CONCEPT	10	02	08	05	15
6	EVOLUTION OF MOBILE TECHNOLOGIES	10	02	08	05	15
	Total	48	21	34	15	70
	Legends::R::--Remember, U::--Understand, A::--Application					

This specification table provides guideline to teacher to teach & assess student also a general guideline to frame theory paper & practical theory exam paper which student have to undertake. The actual distribution of marks at different taxonomy level in the question paper may vary from above table.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher&Address
1.	D.C.Agarwal	Satellite Communication	1st	2021	Khanna Publishers
2.	Dennis Roddy	Satellite Communication	4th	2017	Tata McGraw-Hill
3.	Gary M.Miller	Modern Electronic communication	6th	1998	Pearson
4	T.S.Rappaport	Wireless Communication Principles & Practices	2nd	2010	Pearson Education
5	William Lee	Mobile Cellular Tele Communication	3rd	2005	TataMc Graw Hill
6	Upena Dalal & Manoj K. Shukla	Wireless and Mobile Communication_	1st	2016	Oxford University Press

LEARNING WEBSITES /WEB REFERENCES:

<https://mrcet.com> › digital_notes ›<https://lecturenotes.in> › Mobile Communication
<https://www.researchgate.net>
<https://www.tutorialspoint.com/microwave> components and devices
<http://nptel.ac.in/downloads/satellite> communication systems
<http://nptel.ac.in/downloads/wireless> and cellular communications

Program Title				Diploma in Electronics & Telecommunication Engineering								
Course Code	ETPC 503		Course Title	MICROWAVE & FIBER OPTICS COMMUNICATION							Semester	5
Teaching Scheme					Examination Scheme							
Credits					Theory			Practical	Oral	Online	Term work	Total
Lecture	Tutorial	Practical	Total		ESE	PA	Total					
3	-----	2	4		70	30#	100	50	-----	-----	25	175
	1) Theory paper duration 3hrs. 2) Theory paper assessment is Internal and External. 3) The assessment of practical is Internal and External. 4) # Progressive Assessment out of 30 marks , 20 marks is average of 2 periodical tests(PT)and 10marks are for micro project assessment.											

RATIONALE:

Microwave communication is the backbone of terrestrial communication and also the sole of mobile communication. To provide communication at different geographical locations and for specific task microwave links are the established telecommunication solution. Optical communication is developing at very fast pace. Cost trends for fiber vs copper, better transmission quality, high data rate, large bandwidth and reduction in fiber maintenance expense are the major reasons for fast adaptation of this mode of communication. This course has been designed to develop skills in the diploma engineers to maintain microwave and fiber optics based telecommunication systems.

COURSE OUTCOMES:--

Course theory content, practical skills, experience help student to understand basic terms, functions & uses of Microwave and Fiber Optic Communication, thus student should able to

Semester	5	Subject	MICROWAVE & FIBER OPTICS COMMUNICATION
C0503	3rd Course in Third Year		
C0503.1	Analyze the working principle and operation of different microwave devices		
C0503.2	Maintain passive microwave components and devices		
C0503.3	Maintain active microwave components and devices		
C0503.4	Analyze Light ray propagation through optical fibers		
C0503.5	Interpret the constructional features of single mode & multimode fibers		
C0503.6	Identify the optical losses in optical fiber such as dispersion, scattering, Absorption.		

Mapping of Course outcomes(Cos) to Program outcomes(Pos)

SEM V	MICROWAVE & FIBER OPTICS COMMUNICATION						
C0503	(3 rd Course in Third Year) PREPARED BY:KHK						
	P01	P02	P03	P04	P05	P06	P07
C0503.1	3	2	1	2	1	1	3
C0503.2	3	3	2	3	1	1	3
C0503.3	3	3	2	3	1	1	3
C0503.4	3	2	2	1	1	1	3
C0503.5	3	3	2	2	1	1	3
C0503.6	3	3	2	2	1	1	3
CO TOTAL	18	16	11	13	06	06	18
CORRELATION LEVEL	3	3	2	2	1	1	3

TABLE TO DECIDE CORRELATION LEVELS

COSUM TOTAL	06	12	18
CORRELATION LEVEL	1	2	3

COSUM 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. K. H. Kamath

	Section—1						
Chapter No	Topics	Periods	Marks				Cos
		Hrs.	R	U	A	Total	
1	FUNDAMENTALS OF MICROWAVE COMMUNICATION						
	1.1 Microwave Frequency spectrum, Band Designations and Applications of Microwave in Various Fields. 1.2 Waveguides 1.2.1 Types of Waveguides 1.2.2 Advantages , Disadvantages 1.2.3 Applications of Waveguides 1.3 Circular Waveguides 1.3.1 Construction of Circular Waveguide 1.3.2 Cut off wavelength of Circular Waveguide 1.3.3 Advantages, Disadvantages 1.3.4 Applications of Circular Waveguides 1.4 Comparison of Rectangular and Circular Waveguides	04	02	04	-	06	CO 503.1
2	MICROWAVE PASSIVE COMPONENTS						
	2.1 Multiple Junctions : Working Principle and Applications of (i) E – Plane ii) H- Plane (iii) Magic TEE 2.2 Ferrite Components : Working Principle and Applications of (i) Isolator ii) Circulator 2.3 Comparison of Isolator and Circulator 2.4 Directional Couplers : 2.4.1 Two Hole Directional Coupler – Construction, Working Principle and Applications	08	03	04	06	13	CO 503.2
3.	MICROWAVE ACTIVE COMPONENTS						
	3.1 Microwave Tubes Classification 3.2 Construction, Bunching Process, Principle of operation and Applications of (i) Two Cavity Klystron Amplifier (ii) Reflex Klystron 3.3 Construction, Operating Principle and Applications of (i) Magnetron (ii) Travelling Wave Tube (TWT) 3.4 Performance Characteristics / Specifications of Klystron, Magnetron and TWT	12	03	05	08	16	CO 503.3

	3.5 Comparison of Klystron Tubes and TWT 3.6 GUNN Diode : 3.6.1 Construction and Gunn modes of operation 3.6.2 Advantages, Disadvantages and Applications 3.6.3 Gunn diode as an Oscillator 3.7 PIN Diode: 3.7.1 Construction and Principle of Operation 3.7.2 Advantages, Disadvantages and Applications 3.7.3 PIN Diode as an Amplitude Modulator						
	Section--2						
Chapter No.	Topics	Periods	Marks				COs
		Hrs.	R	U	A	Total	
4	FUNDAMENTALS OF FIBER OPTIC COMMUNICATION						
	4.1 Block Diagram of Fiber Optic Communication. 4.2 Advantage & disadvantages of Optical Fiber Communication 4.3 Definition of Reflection, Diffraction , Dispersion, Absorption and Scattering 4.4 Light Wave Spectrum 4.5 Definition of Snell's Law, Numerical Aperture, Acceptance angle, acceptance cone, Critical Angle	04	04	02	-	06	CO 503.4
5	OPTICAL FIBERS – TYPES AND COMPONENTS						
	5.1 Construction of Fiber Optic Cable. 5.2 Characteristics of Optical Fiber Cables. 5.3 Modes of Propagation: 5.3.1 Single Mode Fibers and Multi Mode Fibers – Comparison 5.4 Index Profile of the Optical Fibers: 5.4.1 Step Index Fibers and Graded Index Fibers 5.5 Optical Fiber Classifications : 5.5.1 Single Mode Step Index Fiber 5.5.2 Multi Mode Step Index Fiber 5.5.3 Multi mode Graded Index Fiber 5.6 Comparison of Step Index and Graded Index Fiber 5.7 Light Sources : 5.7.1 Requirements of Light Sources 5.7.2 Construction and Working Principle of (i) LED and (ii) LASER 5.7.3 Comparison of LED and LASER	12	03	06	08	17	CO 503.5

	5.8 Optical Detectors : 5.8.1 Requirements of Optical Detector 5.8.2 Construction and Working Principle of (i)PIN Photo Diode and (ii)Avalanche Photo Diode 5.8.3 Comparison of PIN Diode and APD						
6	OPTICAL LOSSES						
	6.1 Losses in Optical Fibers 6.1.1 Losses due to Attenuation 6.1.2 Absorption Losses 6.1.3 Scattering Losses 6.1.4 Bending Losses – Micro and Macro 6.1.5 Dispersion Loses - Inter Modal and Intra Modal 6.2 Spicing Techniques – Advantages and Disadvantages 6.3 OTDR (Optical Time Domain Reflectometer)- architecture, functioning & requirements	08	03	03	06	12	CO 503.6

IMPLEMENTATION STRATEGY:

- 1) Use of Power Point presentations and Videos
- 2) References from the internet **(for teachers as well as students)**
- 3) Extensive use of examples
- 4) Group discussions and micro project
- 5) Assignments for writing skills, create awareness about selection /purchasing components

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME	CHAPT. NO.
1	Study of different components of Microwave	CO 503.2	2
2	Characteristics of Reflex Klystron Tube	CO 503.3	3
3	Frequency measurement of Microwave signal using Frequency meter.	CO 503.1	1
4	Frequency measurement and wavelength of X band Reflex Klystron	CO 503.3	3
5	Coupling factor of a Cross-Directional Coupler	CO 503.3	3
6	Measurements on Attenuators	CO 503.3	3
7	Analog Signal Transmission through Fiber Optic Cable	CO 503.4	4
8	Voice Signal Transmission through Fiber Optic Cable	CO 503.4	4
9	Measurement of Bending Losses	CO 503.6	6
10	Measurement of Numerical Aperture	CO 503.6	6
11	Characteristics of LED(Source)	CO 503.5	5
12	Characteristics of PIN (Detector) Diode	CO 503.5	5

IMPLEMENTATION STRATEGY

1. Teaching plan
2. Minimum 10 practicals

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	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)
STUDENT SPN							
1303001							
1303002							
1303004							

* 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 LIST OF MICROPROJECTS

Micro project could be group based. A suggestive list is given here. Similar micro projects could be added by concerned faculty. Each student will maintain dated work diary with details of individual contribution. Assessment is done by concerned faculty based on their performance and presentation of submission.

1. Market survey of consumer microwave equipments with respect to working principle, manufacturer, and technical specifications and submit the detailed report of it.
2. Prepare power point presentations to explain working of various microwave components and microwave tubes.
3. Using LED as optical source, photo diode as optical detector and plastic fiber cable, make prototype optical communication system
4. Prepare survey report to compare technical specifications of different types optical sources and detectors

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	FUNDAMENTALS OF MICROWAVE COMMUNICATION	04	02	04	-	06
2	MICROWAVE PASSIVE COMPONENTS	08	03	04	06	13
3	MICROWAVE ACTIVE COMPONENTS	12	03	05	08	16
	Section II					
4	FUNDAMENTALS OF FIBER OPTIC COMMUNICATION	04	04	02	-	06
5	FIBER OPTIC COMMUNICATION – TYPES AND COMPONENTS	12	03	06	08	17
6	OPTICAL LOSSES	08	03	03	06	12
	Total	48	18	22	30	70
	Legends::R::--Remember, U::--Understand, A::--Application					
This specification table provides guideline to teacher to teach & assess student also a general guideline to frame theory paper & practical theory exam paper which student have to undertake. The actual distribution of marks at different taxonomy level in the question paper may vary from above table.						

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher&Address
1.	Das Annapurna and Das S.K.	Microwave Engineerring	3rd	2017	McGraw Hill, New Delhi.
2.	Sanjeev Gupta	Microwave Engineerring	3rd	2004	Khanna Publications New Delhi
3.	Liao Samuel Y	Microwave devices & circuits	Latest		PHI Learning, New Delhi
4	Kolimbiris, Harold	Fiber optic communication	3rd	2010	Pearson Prentice Hall, , New Delhi
5	A. Selverajan	Optical Fiber Communication	3rd	2010	Tata McGraw-Hill, New Delhi
6	Gary Miller	Modern Electronic communication	Latest	-	Prentice Hall of India, New Delhi
7	Keiser	Optical Fiber Communication	Latest	-	Tata McGraw-Hill International

LEARNING WEBSITES /WEB REFERENCES:

[https://www.tutorialspoint.com/microwave components and devices](https://www.tutorialspoint.com/microwave-components-and-devices)
[http://freevideolectures.com/fiber optics](http://freevideolectures.com/fiber-optics)
[http://nptel.ac.in/downloads/microwave engineering](http://nptel.ac.in/downloads/microwave-engineering)
[http://nptel.ac.in/downloads/fiber optics](http://nptel.ac.in/downloads/fiber-optics)

Program Title				Diploma in Electronics & Telecommunication Engineering							
Course Code	ETPC 504		Course Title	DATA COMMUNICATION AND COMPUTER NETWORKING						Semester	5
Teaching Scheme				Examination Scheme							
Credits				Theory			Practical	Oral	Online	Term work	Total
Lecture	Tutorial	Practical	Total	ESE	PA	Total					
3	-----	2	4	70	30#	100	-----	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) Progressive Assessment out of 30 marks, 20 marks is average of 2 periodical tests (PT) and 10 marks are for micro project assessment.										

RATIONALE:

This subject comes under the Application Technology group and students are intended to learn, understand, and apply the concepts. Data communication and computer networking is a crucial subject in the field of computer science and information technology. The subject forms the backbone of modern communication systems and enables the exchange of data and information between devices and systems. The prerequisite for this subject is digital communication subject which was taught in the preceding semester. The Key rationale's for this subject are as follows: Foundation of Modern Computing, Connectivity, Hardware requirements and Compatibility, Basis of Internet, Emerging Technologies, Business Applications, Security Aspects, Career Opportunities, Problem-Solving Skills and Troubleshooting the network, Global Perspective, Innovation and Research.

COURSE OUTCOMES: --

Course theory content and practical skills will help student to Understanding of Networking Concepts, Ability to Design and Implement Networks, Knowledge of Network Protocols, Network Administration Skills, Network Security Awareness, Knowledge of Network Management, Application of Networking Concepts and Communication and Collaboration Skills.

Semester	5	Subject	DATA COMMUNICATION AND COMPUTER NETWORKING
C0504	4th Course in Third Year		
CO 504.1	Understand the network and its classification, protocol, and standards.		
CO 504.2	Identify the type of topology, medium, network connecting devices, switching types and categorize services.		
CO 504.3	Analyze functions of layers in the models and Investigate protocols in tool/s.		
CO 504.4	Classify errors and apply detection and correction codes to information/data		

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

SEM V	DATA COMMUNICATION AND COMPUTER NETWORKING						
CO	(4th Course in Third Year) PREPARED BY: Dr. Mahesh Munde						
	P01	P02	P03	P04	P05	P06	P07
CO504.1	3	3	1	1	1	1	3
CO 504.2	3	3	2	3	2	2	3
CO 504.3	3	3	1	3	1	1	3
CO 504.4	3	3	2	2	2	2	3
CO TOTAL	12	12	06	09	06	06	12
CORRELATION LEVEL	3	3	1	2	1	1	3

TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	06	09	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

Subject Experts**Dr. Mahesh Munde**

Section -- 1							
Chapter No.	Topics	Periods	Marks				COs
		Hrs.	R	U	A	Total	
1	BASIC NETWORK CONCEPTS AND STANDARDS						
	1.1 Understanding Network – Basic Computer Network, Classification of Networks by their Geography: LAN, MAN, WAN and by their Functions: Peer-Peer network, Client-Server. 1.2 Communication Protocols and Standards: De-facto & De-Jurie, Standards Organizations (ITU-T, ANSI, IEEE, IANA, ISO, FCC), IEEE protocols.	09	06	06	03	15	CO 504.1
2	NETWORKING DEVICES AND SERVICES						
	2.1 Types of Topologies: Bus, Ring, Star, Mesh, Tree, Hybrid Topology; Comparative study of Topologies Advantages, Limitations. 2.2 Types of Medium: Wireless and Wired. 2.3 Network Connecting devices: Network interface card (NIC), Repeaters, Hubs, Bridges, Switches, Router. 2.4 Types of Switching: Circuit Switching, Message switching and Packet Switching. 2.5 Connectionless services & Connection-oriented services.	15	06	09	05	20	CO 504.2
Section -- 2							
		Hrs.	R	U	A	Total	
3	INTERNETWORKING MODELS						
	3.1 OSI Reference Model: Need, definition 3.2 Seven Layers of OSI Model: Functions and Applications 3.3 TCP/IP Model: Need, definition 3.4 Four Layers of TCP/IP Model: Functions and Applications 3.5 Comparison of the OSI and TCP/IP reference models.	15	06	06	08	20	CO 504.3
4	TRANSMISSION ERRORS-DETECTION & CORRECTION						
	4.1 Error Classification: Types of Errors; Distortion, Attenuation, Noise. 4.2 Error Detection -Vertical redundancy check; longitudinal redundancy check; Cyclic redundancy check. 4.3 Error Correction Code: Hamming Code 4.4 Numerical 's on CRC and Hamming Code	09	03	06	06	15	CO 504.4

IMPLEMENTATION STRATEGY:

- 1) Use of PowerPoint presentations and Videos
- 2) References from the internet (for teachers as well as students)
- 3) Extensive use of examples and simulators
- 4) Group discussions and micro project
- 5) Assignments for writing skills, create awareness about selection /purchasing components

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME	CHAPT. NO.
1	Preparation of LAN cable	C	1
2	Installation of client operating system and application	C	1
3	Installation of server operating system and application	C	1
4	To perform Bus and Ring topology in software simulator	C	2
5	To perform Mesh and Star topology in software simulator	C	2
6	To perform Tree and Hybrid topology in software simulator	C	2
7	Assigning IP addresses to network components	C	3
8	To perform Basic Switch Configuration.	C	3
9	To perform Basic Router Configuration.	C	3
10	LAN to WAN communication	C	3 and 4

IMPLEMENTATION STRATEGY

1. Teaching plan
2. Minimum 8 practical's

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	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)
	STUDENT SPNO						
	2203001						
	2203002						

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

Micro projects could be individual or group based activity. A suggestive list is given here, similar micro projects could be added by concerned faculty. Each student will maintain work carried out in diary with details of individual contribution. Assessment is done by theory teacher based on their working or understanding level of the project during submission.

SR. NO.	TITLE
1	Installation of Domain Controller and applying policies
2	Preparation of Coaxial Cable/ FOC cable for network (10-50 meters)
3	Packet Sniffing: Understanding Data Transmission Dynamics
4	Network Traffic Analysis: Insights into Data Flow Patterns
5	Ethernet vs. Wi-Fi: Comparative Performance Analysis
6	TCP/IP Protocol Suite: Implementation and Analysis
7	Secure Communication Protocols: A Study on SSL/TLS
8	Network Performance Optimization: QoS and Bandwidth Management"
9	IPv4 vs. IPv6: Evolution and Comparative Analysis
10	Wireless Networking: Challenges and Solutions
11	Network Security: Vulnerability Assessment and Countermeasures
12	Cloud Networking: Architecture and Deployment Strategies

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
	Section I					
1	BASIC NETWORK CONCEPTS AND STANDARDS	09	06	06	03	15
2	NETWORKING DEVICES AND SERVICES	15	06	09	05	20
	Section II					
3	INTERNETWORKING MODELS	15	06	06	08	20
4	TRANSMISSION ERRORS-DETECTION & CORRECTION	09	03	06	06	15
	Total	48	21	27	22	70
	Legends:: R ::- Remember , U ::- Understand , A ::-Application					

This specification table provides guidelines to teacher/s to teach & assess students, also a general guideline to frame theory exam paper which student have to undertake. The actual distribution of marks at different taxonomy level in the question paper may vary from above table depending upon the paper setters views.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	Behrouz A. Forouzan	Data Communications and Networking	5 th	2022	McGraw Hill, New Delhi
2.	William Stallings	Computer Networks	7 th	2022	McGraw Hill, New Delhi
3.	Andrew S. Tanenbaum	Computer Networks	5 th	2010	McGraw Hill, New Delhi
4	Achyut S. Godbole	Data Communication & Networking	4 th	2022	Tata McGraw-Hill

LEARNING WEBSITES / WEB REFERENCES :

- **Cisco Networking Academy:** Offers comprehensive courses on networking, including networking fundamentals, routing, and switching, security, and more. (<https://www.netacad.com/>)
- **Coursera:** Provides online courses from universities and organizations on various aspects of networking, including introductory courses and specialized topics. (<https://www.coursera.org/>)
- **edX:** Offers courses from universities and institutions worldwide, covering topics like computer networking, network security, and wireless communication. (<https://www.edx.org/>)
- **Khan Academy:** Provides free courses and tutorials on computer networking basics and related topics. (<https://www.khanacademy.org/computing>)
- **Cybrary:** Offers free and paid courses on networking, cybersecurity, and IT infrastructure, including hands-on labs and certifications. (<https://www.cybrary.it/>)
- **YouTube:** Some popular channels include Network Chuck, David Bombal, and Eli the Computer Guy.
- **Networking-Forums.com:** A community-driven forum where networking professionals discuss various networking topics, share knowledge, and seek help. (<https://networking-forums.com/>)
- **Tech Target Search Networking:** Provides articles, tutorials, and resources on networking technologies, trends, and best practices. (<https://searchnetworking.techtarget.com/>)
- **Cisco DevNet:** Offers learning labs, sandboxes, and resources for developers and network engineers to learn about Cisco technologies and APIs. (<https://developer.cisco.com/>)
- **The Wireshark Network Protocol Analyzer:** Provides documentation, tutorials, and resources for learning about network protocol analysis using Wireshark. (<https://www.wireshark.org/>)

Program Title				Diploma in Electronics & Telecommunication Engineering								
Course Code	ETES 505		Course Title	INDUSTRIAL MANAGEMENT						Semester	5	
Teaching Scheme				Examination Scheme								
Credits				Theory			Practical	Oral	Online	Term work	Total	
Lecture	Tutorial	Practical	Total	ESE	PA	Total						
3	-----	---	3	70	30#	100	----	-----	-----	----	100	
	1) Theory paper duration 3 hrs. 2) Theory paper assessment is Internal and External. 3) The assessment of practical is Internal and External. 4) # Progressive Assessment out of 30 marks , 20 marks is average of 2 periodical tests (PT) and 10 marks are for micro project assessment.											

COURSE OUTCOMES:--

Course theory content, practical skills, experience help student to understand basic electronics circuit terms & network methods, thus student should able to

Semester	5	Subject	INDUSTRIAL MANAGEMENT
C0505		5 th Course in Second Year	
CO 505.1		Analyze the concept of Management	
CO 505.2		Differentiate between Administrations and organizations	
CO 505.3		Analyze the concept of planning and organizing	
CO 505.4		Analyze the need of Directing and Controlling	
CO 505.5		Identify the Safety norms	
CO 505.6		Implement of Legislative Acts	

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

SEM V	INDUSTRIAL MANAGEMENT						
CO 505	(5th Course in Third Year) PREPARED BY : Dr. Shivaji Ghungrad Mr. Abhijit Patil						
CO 505.1	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 505.2	3	3	3	2	2	1	2
CO 505.3	3	3	2	1	2	1	2
CO 505.4	3	3	3	2	1	2	2
CO 505.5	3	3	3	2	1	1	2
CO 505.6	3	3	3	2	1	1	2
CO TOTAL	15	15	14	09	07	06	10
CORRELATION LEVEL	3	3	2	2	1	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

Subject Experts**Dr. Shivaji Ghungrad****Mr. Abhijit Patil**

Section -- 1							
Chapter No	Topics	Periods	Marks				COs
		Hrs.	R	U	A	Total	
1	PRINCIPLES AND TECHNIQUES OF MANAGEMENT						
	1.1 Definitions of management, role and importance of management. 1.2 Management characteristics and principles, levels of management and their functions; Management, administration and organization, relation between management and administration. 1.3 Functions of management: planning, organizing, leading/directing, staffing and controlling. 1.4 Types of planning and steps in planning. 1.5 Types of organization, steps in organizing 1.6 Functional areas of management. 1.7 Managerial skills.	12	06	06	06	18	CO 505.1 505.2
2	PLANNING AND ORGANIZING AT SUPERVISORY LEVEL						
	2.1 Planning by supervisor 2.2 Planning activities, detailing and following of each step. 2.3 Prescribing standard forms for various activities. 2.4 Budgeting for materials and manpower 2.5 Organizing the physical resources. 2.6 Matching human need with job needs. 2.7 Allotment of task to individuals and establishing relationship among persons working in a group.	08	05	06	06	17	CO 505.3
Section -- 2							
Chapter No.	Topics	Periods	Marks				COs
		Hrs.	R	U	A	Total	
3	DIRECTING AND CONTROLLING AT SUPERVISORY LEVEL						
	3.1 Needs for directions and instructions to subordinates; Completeness and feasibilities of instructions. 3.2 Personal counselling advanced predictions of possible mistakes. 3.3 Elaborating decision, laying disciplinary standards in overall working.	08	04	04	03	11	CO 505.4

	3.4 Managerial control Understanding team and link between various departments in respect to process and quality standards; Steps in control process. 3.5 Controlling methods; control over the performance in respect of quality, quantity of production, time and cost. Measuring performance, correcting unfavorable deviations.						
4	SAFETY MANAGEMENT						
	4.1 Need for safety management measures. 4.2 General Safety norms for an industrial unit; Preventive measures. 4.3 Definition of accident, types of industrial accident; Causes of accidents; 4.4 Fire hazards; Fire drill. 4.5 Safety procedure. 4.6 Work permits.	08	04	04	04	12	CO 505.5
5	LEGISLATIVE ACTS						
	5.1 Necessity of acts, Important definition and Main provisions of acts. 5.2 Industrial Acts: a. Indian Factory Act b. Industrial Dispute Act c. Workman Compensation Act d. Minimum Wages Act.	12	02	06	04	12	CO 505.6

IMPLEMENTATION STRATEGY:

- 1) Use of PowerPoint presentations and Videos
- 2) References from the internet **(for teachers as well as students)**
- 3) Extensive use of examples
- 4) Group discussions and micro project
- 5) Assignments for writing skills, create awareness about selection /purchasing components

SUGGESTED LIST OF MICROPROJECTS

Micro project could be group based. A suggestive list is given here, similar micro projects could be added by concerned faculty. Each student will maintain dated work diary with details of individual contribution. Assessment is done by project guide based on their performance and presentation of submission.

SR. NO.	TITLE
1	Study of management principles applied to a small scale industry.
2	Study of management principles applied to a medium scale industry.
3	Study of management principles applied to a large scale industry.
4	Prepare case studies of Safety measures followed in different types of organization.
5	Study of measures to be taken for ensuring cyber security.

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	12	06	06	06	18
2	PLANNING AND ORGANIZING AT SUPERVISORY LEVEL	08	05	06	06	17
	Section II					
3	DIRECTING AND CONTROLLING AT SUPERVISORY LEVEL	08	04	04	03	11
4	SAFETY MANAGEMENT	08	04	04	04	12
5	LEGISLATIVE ACTS	12	02	06	04	12
	Total	48	21	26	23	70
	Legends :: R ::- Remember , U ::- Understand , A ::-Application					
This specification table provide guide line to teacher to teach & assess student also a general guideline to frame theory paper & practical theory exam paper which student have to undertake. The actual distribution of marks at different taxonomy level in the question paper may vary from above table.						

REFERENCES

Sr. No.	Ment Author	Title	Edition	Year of Publication	Publisher & Address
1.	Dr. O.P Khanna	Industrial Engineering & Management	1st	1999	Dhanpat rai& publications
2.	Veerabhadra ppa, Havinal	Management and entrepreneurship	1st	2014	New age international publishers

LEARNING WEBSITES / WEB REFERENCES :

- <https://www.griet.ac.in/case-study>
- <https://sctevtodisha.nic.in/wp-content/plugins/LectureNote>
- <https://www.youtube.com/>

Program Title				Diploma in Electronics & Telecommunication Engineering								
Course Code	ETOE 506	Course Title		CAPSTON PROJECT						Semester	5	
Teaching Scheme					Examination Scheme							
Credits					Theory			Practical	Oral	Online	Term work	Total
Lecture	Tutorial	Practical	Total		ESE	PA	Total					
---	-----	2	1		---	---	---	-----	50	-----	50	100
	1) The Project assessment of Oral is Internal and External. 2) 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: --

Course theory content and practical skills will help student to Understanding of Networking Concepts, Ability to Design and Implement Networks, Knowledge of Network Protocols, Network Administration Skills, Network Security Awareness, Knowledge of Network Management, Application of Networking Concepts and Communication and Collaboration Skills.

Semester	5	Subject	CAPSTON PROJECT
C0506	6th Course in Third Year		
C506.1	Reinforce and integrate previously acquired lower sub-skills and attitudes within a branch and slowly transform them into higherlevel skills		
C506.2	Develop competencies and confidence to solve open and reallife interdisciplinary problems.		
C506.3	Develop thinking, planning and decision making skills with ample scope for using creativity.		
C506.4	Present a challenging and task oriented learning environment with optional solutions		
C506.5	Develop confidence in accomplishing targets with given timeand resources constraints and work as a team		

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

SEM V	CAPSTON PROJECT							
CO	(6th Course in Third Year) PREPARED BY: Dr. Janani Natarajan							
	P01	P02	P03	P04	P05	P06	P07	
CO506.1	3	2		2	3	3	3	
CO 506.2	3	2		2	3	3	3	
CO 506.3	3	2		2	3	3	3	
CO 506.4	3	2		2	3	3	3	
CO 506.5	3	2		2	3	3		
CO TOTAL	15	10	00	10	15	15	12	
CORRELATION LEVEL	3	3	0	3	3	3	3	

TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	06	09	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

Subject Experts**Dr. JANANI NATARAJAN**

OBJECTIVES/ CRITERIA FOR ASSESSMENT:

The students will be able to do the 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**:

- Apply and expand upon the previous knowledge gained in earlier semesters.
- Work with confidence on PCB's, soldering/ de-soldering, testing of circuit, etc.
- Make logical decisions pertaining to requirements of project.
- Solve problems faced during the design and building and testing phases of project.
- 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 above in the corresponding objectives/ criteria, during the practical time** allotted to them for the **PROJECT WORK**. 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			