Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E.(SEM:** I)		
Course Name: Advanced Communication Networks							**Course Code:** PCC-CTMME101		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	--	--	3	3	25	75	--	--	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Principles of Communication, Digital Communication, Computer Networks and Application, Fiber optic, Satellite Communication, Mobile Communication.									

Course Objectives: At the end of this course, students should be able to develop understanding of some fundamental techniques used to model and analyze communication networks. The emphasis in this course will be more on developing analytical tools and conceptual models and less on describing the protocols used in current networks. However, some current protocols will be used to illustrate the concepts.

Course Outcomes: At the end of this course, students will be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's Taxonomy
1	Understand advanced concepts in Communication Networking.	L1, L2, L3
2	Design and develop protocols for Communication Networks.	L1, L2, L3, L4, L5, L6
3	Describe the mechanisms in Quality of Service in networking.	L1, L2, L3, L4, L5
4	Optimize the Network Design.	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's
1	Overview of Internet-Concepts, challenges, and history. Overview of -ATM. TCP/IP Congestion and Flow Control in Internet-Throughput analysis of TCP congestion control. TCP for high bandwidth-delay networks. Fairness issues in TCP.	07	L1, L2
2	Real-Time Communications over the Internet. Adaptive applications. Latency and throughput issues. Integrated Services Model (intServ). Resource reservation on the Internet. RSVP; Characterization of Traffic by Linearly Bounded Arrival Processes (LBAP). Leaky bucket algorithm and its properties.	07	L1, L2, L3

3	Packet Scheduling Algorithms-requirements and choices. Scheduling guaranteed service connections. GPS, WFQ, and Rate proportional algorithms. High-speed scheduler design. Theory of Latency Rate servers and delay bounds in packet-switched networks for LBAP traffic; Active Queue Management - RED, WRED, and Virtual clock. Control theoretic analysis of active	08	L1, L2, L3
4	IP address lookup challenges. Packet classification algorithms and Flow Identification- Grid of Tries, Cross producing, and controlled prefix expansion algorithms.	07	L1, L2, L3, L4
5	Admission control on the Internet. Concept of Effective Bandwidth. Measurement-based admission control. Differentiated Services in Internet (DiffServ). DiffServ architecture and framework.	08	L1, L2, L3, L4
6	IPV4, IPV6, IP tunneling, IP switching and MPLS, Overview of IP over ATM and its evolution to IP switching. MPLS architecture and framework. MPLS Protocols. Traffic engineering issues in MPLS.	08	L1, L2, L3, L4
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	High-Performance Communications Networks	Jean Walrand and Pravin Varaiya	Morgan Kaufman	2nd Edition	1996
2	Network Calculus A Theory of Deterministic Queueing Systems for the Internet	Jean-Yves Le Boudec and Patrick Thiran	Springer	--	2001
3	Internet QoS	Zhang Wang	Morgan Kaufman	1st Edition	2001
4	Communication Networking: An Analytical Approach	Anurag Kumar, D. Manjunath, and Joy Kuri	Morgan Kaufman Publishers	--	2004
5	ATM Network Performance	George Kesidis	Kluwer Academic Research Papers	--	2005

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	NPTEL	https://onlinecourses.nptel.ac.in/noc22_ee61	M1, M2, M3

Formative Assessment: Continuous assessment of the student has to be conducted weekly either by administering a class test/assignment/live problems/course project/Multiple Choice Questions/Quiz.
Mid Semester Assessment: The **Mid Semester Assessment** is to be conducted when minimum 40% syllabus is completed in the form of a test of 25 marks. Duration of this exam shall be one and half hour.
The marks assigned out of 25 will be the weighted average of Formative Assessment and mid semester assessment.

End Semester Assessment:
Some guidelines for setting up the question paper. Minimum 90% syllabus should be covered in question papers of end semester examination. In a question paper weightage of each module will be proportional to number of respective lecture hours as mention in the syllabus.

1. Question paper will comprise of total six questions.
2. All question carries equal weightage of 15 marks.
3. Only five question need to be solved.
4. Duration of this exam shall be three hours.

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Telecom Network Management							**Course Code:** PCC-CTMME102		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Objective: The course intends to give an overview of Telecom Network Management, its organization and Functions. This course provides a brief overview of network management, network topology and transmission technology.

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1	Understand the principles of Telecommunication Network Management.	L1, L2
2	Gain knowledge on telecom network management protocols.	L1, L2, L3
3	Understand and manage conceptual model of a telecom network	L1, L2, L3
4	Configure and repair faults in telecom network.	L1, L2, L3, L4
5	Understand and manage web server communication	L1, L2, L3, L4
6	Understand and manage IP based telecom network .	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy
1	**Introduction to Telecom Network Management**: Overview of Data Communication and Network Management-Goals, Organization and Functions; Network Management-Architecture and Organization; Network Management Perspectives; Current Status and Future of Network Management. Network Topology, Network Node Components, Transmission Technology.	8	L1, L2

2	**SNMP and Network Management:** Network Management Standards, Network Management Models, Organizational Model, Information Model, Communication Model. SNMPv1-History of SNMP, Internet Organization and Standards, SNMP Model, Organizational Model, System Overview, Information Model. SNMP Communication Model, Functional Model.SNMPv2 and SNMv3.	8	L1, L2, L3
3	**Telecommunication Management Network:** TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, TMN Integrated View, TMN Implementation.	8	L1, L2, L3
4	**Network Management Application**: Configuration Management, Fault Management, Performance Management, Security Management, Service Level Management, Accounting Management, Report Management, Policy- Based Management.	8	L1, L2, L3, L4
5	**Web Based Management:** Setting-UP LAN Access, SNMP configuration, Switched Port Analyzer, Web Browser / Web Server Communication.	7	L1, L2, L3, L4
6	**IP Network Management:** Configuration, Management Information Base, Simple Network Management Protocol, IP-Based Service Implementation-Network Management Issues, OSS Architecture.	6	L1, L2, L3, L4
	Total	**45**	

Books and References:

S. No.	Title	Authors	Publisher	Edition	Year
1	Network Management-Principles and Practice	Mani Subramanian	Addison- Wesley	5th Edition	2010
2	Telecommunications Network Technologies and Implementations	Salah Aiidarons, Thomas Plevayk	Eastern Economy Edition IEEE press, New Delhi	2nd Edition	1998
3	Fundamentals of Telecommunication Network Management	Lakshmi. G, Raman,	Eastern Economy Edition IEEE Press, New Delhi	4th Edition	2015
4	Network Management: Concepts and Practice, A Hands-on Approach	I J. Richard Burke	Pearson Education,	5th Edition	2008

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	Science Direct	Telecommunication Management Network - an overview | ScienceDirect Topics	M1, M2, M3
2	Cisco	Network Management Systems Architectural Leading Practice [High Availability] - Cisco Systems	M3
3	www.hit.bme.hu	Telecommunications Management Network (TMN) (bme.hu)	M1, M2

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

<table>
<tr><td colspan="8">M. E. (Communication Technology & Management)</td><td colspan="4">SEM: I</td></tr>
<tr><td colspan="8">Course Name: Professional Elective I (Wireless Sensor Networks)</td><td colspan="4">Course Code: PEC- CTMME1011</td></tr>
<tr><td colspan="8">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="8">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="3">Theory (100)</td><td>Practical/Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td colspan="2">ESE</td><td rowspan="2">--</td><td rowspan="2">--</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>5</td><td>4</td><td>25</td><td colspan="2">75</td></tr>
<tr><td colspan="12">IA: In Semester Assessment- Paper Duration – 1.5 Hours
ESE: End Semester Evaluation- Paper Duration - 3 Hours
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="12">Prerequisite: Computer Networks, Mobile Communication Systems</td></tr>
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Course Objective: Course aims to make students understand the concepts of wireless sensor and ad hoc networks, the major challenges and designing issues, various MAC and routing protocols in wireless sensor and ad hoc networks and heterogeneous network architecture including MANET, WLAN, Cellular Networks.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's Taxonomy
1	Understand and describe the concept of wireless sensor networks, Ad hoc networks, and their applications.	L1, L2
2	Describe and evaluate the performance of various routing protocols in wireless sensor and ad hoc networks.	L1, L2, L3
3	Explain the broadcasting and Geo-casting routing techniques in MANETs	L1, L2, L3, L4, L5
4	Describe and examine the performance of Multicasting protocols.	L1, L2, L3
5	Understand and describe the various design issues and challenges in Wireless Sensor Networks.	L1, L2, L3, L4
6	Understand and explain the heterogeneous network architecture comprised of MANETs, WLANs and Cellular Networks.	L1, L2, L3, L4, L5

Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels as per Bloom's Taxonomy
1	**Introduction to MANET and Wireless Sensor Networks** Introduction to WSN and MANET. WPAN: Bluetooth, ZigBee, UWB WLAN: Architecture, PHY and MAC layer, 802.11a, 802.11b, 802.11n. Application of sensor Network, Sensing and Communication Range, Energy and Clustering of sensors	08	L1, L2
2	**Routing in Adhoc Networks** Topologies - Based Routing Protocols: DSDV, WRP, OLSR, DSR, AODV, TORA, ZRP. Position-Based Routing: Location Services: DREAM, Quorum based, Grid based Forwarding Strategies: Greedy packet forwarding, Expected zone routing, Relative Distance Micro-Discovery Ad Hoc Routing. Other Routing Protocols: Signal Stability Routing Protocol, Power Aware Routing, Associativity-Based Routing, QoS Routing.	10	L1, L2, L3
3	**Broadcasting and Geo-casting in MANET** Introduction, The Broadcast Storm, Broadcasting: Ad Hoc Broadcast Protocol, Lightweight and Efficient Network-Wide Broadcast Geo-casting: Location-Based Multicast, Voronoi Diagram Based Geo-casting, Flooding-Based GeoGRID, Route Creation Oriented	08	L1, L2, L3, L4, L5
4	**Multi-casting in MANET** Tree-Based Approaches: Multicast Ad Hoc On-Demand Distance Vector Protocol, Location Guided Tree Construction Algorithm for Small Group Multicast, Multicast Zone Routing. Mesh-Based Approaches: On-Demand Multicast Routing Protocol, Stateless Approaches: Differential Destination Multicast, Hybrid Approaches: Ad Hoc Multicast Routing Protocol	08	L1, L2, L3
5	**Design Issues & Challenges in Wireless Sensor Networks** Introduction, Design Issues & Challenges: Energy, Self-Management, Hardware, Operating System, Middleware, QoS,; Medium Access Schemes, Network and transport layer. Fundamentals of Network Security.	06	L1, L2, L3, L4
6	**Integrating MANETs, WLANs and Cellular Networks** Introduction, Ingredients of a Heterogeneous Architecture, Protocol Stack, Comparison of the Integrated Architectures.	05	L1, L2, L3, L4, L5
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Adhoc & Sensor Networks Theory and Applications	Cordeiro, Agrawal	Cambridge University Press India Pvt. Ltd	Second Edition	2010
2	Adhoc Wireless Networks Architecture and Protocols	C.Siva Ram Murthy and B.S.Manoj	Pearson	Second Edition	2016
3	Adhoc & Sensor Networks	Houda Labiod	Wiley	First Edition	2010
4	Wireless Communication and Networking	Vijay Garg	Elsevier Inc.	First Edition	2004
5	Embedded Systems: An Integrated Approach	Lyla Das	Pearson Publication	First Edition	2013
6	Wireless and Mobile Networks, Concepts and Protocols	Manvi, Kakkasageri	Wiley	Second Edition	2014

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	NPTEL	https://nptel.ac.in/courses/106/105/106105160/	M1, M2, M4
2	NPTEL	https://ict.iitk.ac.in/courses/wireless-ad-hoc-and-sensor-networks/	M1. M2
3	Swayam	https://onlinecourses.swayam2.ac.in/ugc19_cs10/preview	M4, M5, M6

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Professional Elective I (RF and Microwave Circuit Design)							**Course Code:** PEC- CTMME1012		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1.	Understand the behaviour of RF passive components and model active components.	L1, L2, L3
2.	Perform transmission line analysis	L1, L2, L3, L4
3.	Demonstrate use of Smith Chart for high frequency circuit design	L1, L2, L3, L4
4.	Justify the choice/selection of components from the design aspects.	L1, L2, L3, L4
5.	Contribute in the areas of RF circuit design.	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy
1	Transmission Line Theory: Lumped element circuit model for transmission line, field analysis, Smith chart, quarter wave transformer, generator and load mismatch, impedance matching and tuning.	08	L1, L2, L3
2	Microwave Network Analysis: Impedance and equivalent voltage and current, Impedance and admittance matrix, The scattering matrix,	06	L1, L2, L3, L4
3	Microwave Components: Microwave resonators, Microwave filters, power dividers and directional couplers, Ferromagnetic devices and components.	08	L1, L2, L3, L4
4	Nonlinearity And Time Variance Inter-symbol interference, random process & noise, definition of sensitivity and dynamic range, conversion gain and distortion.	08	L1, L2, L3, L4

5	Microwave Semiconductor Devices And Modeling: PIN diode, Tunnel diodes, Varactor diode, Schottky diode, IMPATT and TRAPATT devices, transferred electron devices, Microwave BJTs, GaAs FETs, low noise and power GaAs FETs, MESFET, MOSFET, HEMT.	08	L1, L2, L3, L4
6	Amplifiers Design: Power gain equations, stability, impedance matching, constant gain and noise figure circles, small signal, low noise, high power and broadband amplifier, oscillators, Mixers design.	07	L1, L2, L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Advanced RF & Microwave Circuit Design: The Ultimate Guide to Superior Design	Matthew M. Radmanesh	AuthorHouse	-	2009
2	Microwave Engineering	D.M.Pozar	Wiley	Fourth Edition	2011
3	R. F. Circuit Design	R.Ludwig and P.Bretchko	Pearson Education Inc	First Edition	2009
4	Microwave Circuit Design Using Linear and Non Linear Techniques	G.D. Vendelin, A.M. Pavoi, U. L. Rohde	John Wiley	--	1990
5	Microwave circuit Analysis and Amplifier Design	S.Y. Liao	Prentice Hall	First Edition	1987
6	RF and Microwave Electronics Illustrated	Radmanesh	Pearson Education	Second Edition	2004

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	Coursera	RF and millimeter-Wave Circuit Design | Coursera	M3, M5, M6
2	NPTEL	https://onlinecourses.nptel.ac.in/noc24_ee75	M3, M5, M6
3	Swayam	https://archive.nptel.ac.in/courses/108/103/108103141	M1- M6

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							M.E. (SEM: I)		
Course Name: Professional Elective I (Statistical Information Processing)							**Course Code:** PEC- CTMME1013		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1	Characterize and apply probabilistic techniques in modern decision systems, such as information systems, receivers, filtering and statistical operations.	L1, L2, L3
2	Demonstrate mathematical modelling and problem solving using such models.	L1, L2, L3, L4
3	Comparatively evolve key results developed in this course for applications to signal processing, communications systems.	L1, L2, L3, L4
4	Develop frameworks based in probabilistic and stochastic themes for modelling and analysis of various systems involving functionalities in decision making, statistical inference, estimation and detection.	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy
1	Review of random variables: Probability Concepts, distribution and density functions, moments, independent, uncorrelated and orthogonal random variables; Vector-space representation of Random variables, Vector quantization, Tchebaychef inequality theorem, Central Limit theorem, Discrete &Continuous Random Variables. Random process: Expectations, Moments, Ergodicity, Discrete-Time Random Processes Stationary process, autocorrelation and auto covariance functions, Spectral representation of random signals, Properties of power spectral density, Gaussian Process and White noise process.	08	L1, L2, L3
2	Random signal modelling: MA(q), AR(p), ARMA(p,q) models, Hidden Markov Model & its applications ,Linear System with random input , Forward and Backward Predictions, Levinson Durbin Algorithm.	06	L1, L2, L3, L4
3	Statistical Decision Theory: Bayes' Criterion, Binary Hypothesis Testing, M-ary Hypothesis Testing, Minimax Criterion, Neyman-Pearson Criterion, Composite Hypothesis Testing. Parameter Estimation Theory: Maximum Likelihood Estimation, Generalized Likelihood Ratio Test ,Some Criteria for Good Estimators, Bayes' Estimation Minimum Mean-Square Error Estimate, Minimum, Mean Absolute Value of Error Estimate Maximum A Posteriori Estimate , Multiple Parameter Estimation Best Linear Unbiased Estimator ,Least-Square Estimation Recursive Least-Square Estimator.	08	L1, L2, L3, L4
4	Spectral analysis: Estimated autocorrelation function, Periodogram, Averaging the periodogram (Bartlett Method), Welch modification, Parametric method, AR(p) spectral estimation and detection of Harmonic signals.	07	L1, L2, L3, L4
5	Information Theory and Source Coding: Introduction, Uncertainty, Information and Entropy, Source coding theorem, Huffman, Shanon Fano, Arithmetic, Adaptive coding, RLE, LZW Data compaction, LZ-77, LZ-78. Discrete Memory less channels, Mutual information, channel capacity, Channel coding theorem, Differential entropy and mutual information for continuous ensembles.	08	L1, L2, L3, L4
6	Application of Information Theory: Group, Ring & Field, Vector, GF addition, multiplication rules. Introduction to BCH codes, Primitive elements ,Minimal polynomials, Generator polynomials in terms of Minimal polynomials, Some examples of BCH codes,& Decoder, Reed- Solomon codes & Decoder, Implementation of Reed Solomon encoders and decoders.	08	L1, L2, L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Probability, Random Variables and Stochastic Processes	Papoulis and S.U. Pillai	McGraw-Hill	4th Edition	2002
2	Statistical and Adaptive Signal Processing	D.G. Manolakis, V.K. Ingle and S.M. Kogon	McGraw-Hill	Fourth Edition	2000
3	Signal Detection and Estimation	Mourad Barkat	Artech House	Second Edition	2005
4	Information theory and reliable communication	R G. Gallager	Wiley	1st Edition	1968
5	The Theory of Error-Correcting Codes	F. J. MacWilliams and N. J. A. Sloane	Elsevier	--	1977
6	Elementary Number Theory	Rosen K.H	Pearson	6th Edition	2011

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	Swayam	https://onlinecourses.nptel.ac.in/noc21_ma74	M1-M3

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							M.E. (SEM: I)		
Course Name: Professional Elective I (DSP Architecture)							**Course Code:** PEC- CTMME1014		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	

IA: In-Semester Assessment - Paper Duration – 1.5 Hours
ESE: End Semester Examination - Paper Duration - 3 Hours
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1.	Identify and formalize architectural level characterization of P-DSP hardware	L1, L2, L3
2.	Ability to design, programming (assembly and C), and testing code using Code Composer Studio environment	L1, L2, L3, L4
3.	Deployment of DSP hardware for Control, Audio and Video Signal processing applications	L1, L2, L3, L4
4.	Understanding of major areas and challenges in DSP based embedded systems	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy
1	Programmable DSP Hardware: Processing Architectures (von Neumann, Harvard), DSP core algorithms (FIR, IIR, Convolution, Correlation, FFT), IEEE standard for Fixed and Floating Point Computations, Special Architectures Modules used in Digital Signal Processors (like MAC unit, Barrel shifters), On-Chip peripherals, DSP benchmarking.	08	L1, L2, L3
2	Structural and Architectural Considerations: Parallelism in DSP processing, Texas Instruments TMS320 Digital Signal Processor Families, Fixed	06	L1, L2, L3, L4

3	VLIW Architecture: Current DSP Architectures, GPUs as an alternative to DSP Processors, TMS320C6X Family, Addressing Modes, Replacement of MAC unit by ILP, Detailed study of ISA, Assembly Language Programming, Code Composer Studio, Mixed Cand Assembly Language programming, On-chip peripherals, Simple applications developments as an embedded environment.	08	L1, L2, L3, L4
4	Multi-core DSPs: Introduction to Multi-core computing and applicability for DSP hardware, Concept of threads, introduction to P-thread, mutex and similar concepts, heterogeneous and homogenous multi-core systems, Shared Memory parallel programming –OpenMP approach of parallel programming, PRAGMA directives, OpenMP Constructs for work sharing like for loop, sections, TI TMS320C6678 (Eight Core subsystem).	08	L1, L2, L3, L4
5	FPGA based DSP Systems: Limitations of P-DSPs, Requirements of Signal processing for Cognitive Radio (SDR), FPGA based signal processing design-case study of a complete design of DSP processor.	08	L1, L2, L3, L4
6	High Performance Computing using P-DSP: Preliminaries of HPC, MPI, OpenMP, multicore DSP as HPC infrastructure.	07	L1, L2, L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Introduction to Parallel Processing	M. Sasikumar, D. Shikhare, Ravi Prakash	PHI	1st Edition	2006
2	Algorithms and Parallel Computing	Fayez Gebali	John Wiley & Sons	1st Edition	2011
3	Parallel Programming in OpenMP	Rohit Chandra, Ramesh Menon, Leo Dagum, David Kohr, DrorMaydan, Jeff Mc Donald	Morgan Kaufman	1st Edition	2000
4	Multicore Embedded systems	Ann Melnichuk,Long Talk	CRC Press	1st Edition	2010
5	High Performance Embedded Computing: Architectures, Applications and Methodologies	Wayne Wolf	Morgan Kaufman	1st Edition	2006
6	Algorithmic Collections for Digital Signal Processing Applications Using MATLAB	E.S.Gopi	Springer	1st Edition	2007

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	https://people.ece.umn.edu/	pdsp (umn.edu)	M1
2	https://ww2.comm.utoronto.ca/	Architectures for Programmable DSPs (utoronto.ca)	M1, M2
3	https://www.xilinx.com/	DSP: Designing for Opitmal Results (xilinx.com)	M1, M2

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Professional Elective I (Remote Sensing)							**Course Code:** PEC- CTMME1015		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1	Understand basic concepts, principles and applications of remote sensing, particularly the geometric and radiometric principles;	L1, L2, L3
2	Provide examples of applications of principles to a variety of topics in remote sensing, particularly related to data collection, radiation, resolution, and sampling.	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy~
1	Physics Of Remote Sensing: Electro Magnetic Spectrum, Physics of Remote Sensing-Effects of Atmosphere-Scattering–Different types–Absorption-Atmospheric window-Energy interaction with surface features –Spectral reflectance of vegetation, soil and water atmospheric influence on spectral response patterns-multi concept in Remote sensing.	08	L1, L2, L3
2	Data Acquisition: Types of Platforms–different types of aircrafts-Manned and Unmanned space crafts–sun synchronous and geo synchronous satellites –Types and characteristics of different platforms –LANDSAT, SPOT, IRS, INSAT, IKONOS, QUICKBIRD etc.	06	L1, L2, L3, L4

3	Photographic products, B/W,color, color IR film and their characteristics –resolving power of lens and film - Optomechanical electro optical sensors –across track and along track scanners, multispectral scanners and thermal scanners–geometric characteristics of scanner imagery - calibration of thermal scanners.	08	L1, L2, L3, L4
4	Scattering System: Microwave scatterometry, types of RADAR –SLAR –resolution –range and azimuth –real aperture and synthetic aperture RADAR. Characteristics of Microwave image stopographic effect-different types of Remote Sensing platforms –airborne and space borne sensors -ERS, JERS, RADARSAT, RISAT - Scatterometer, Altimeter-LiDAR remote sensing, principles, applications.	08	L1, L2, L3, L4
5	Thermal And Hyper Spectral Remote Sensing: Sensors characteristics-principle of spectroscopy imaging spectroscopy–field conditions, compound spectral curve, Spectral library, radiative models, processing procedures, derivative spectrometry, thermal remote sensing –thermal sensors, principles, thermal data processing, applications.	08	L1, L2, L3, L4
6	Data Analysis: Resolution–Spatial, Spectral, Radiometric and temporal resolution-signal to noise ratio-data products and their characteristics-visual and digital interpretation–Basic principles of data processing –Radiometric correction–Image enhancement–Image classification–Principles of LiDAR, Aerial Laser Terrain Mapping.	07	L1, L2, L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Remote Sensing and Image interpretation	Lilles and.T.M. and Kiefer.R.W	John Wiley & Sons	6th Edition	2000
2	Introductory Digital Image Processing: A Remote Sensing Perspective	John R. Jensen	Prentice Hall	2nd Edition	1995
3	Remote Sensing Digital Image Analysis	Richards, John A., Jia, Xiuping	Springer-Verlag Berlin Heidelberg	5th Edition	2013
4	Principles of Remote Sensing	Paul Curran P.J.	Longman Publishing Group	1st Edition	1984
5	Introduction to The Physics and Techniques of Remote Sensing	Charles Elachi, Jakob J. van Zyl	Wiley Series	2nd Edition	2006
6	Remote Sensing Principles and Image Interpretation	Sabins, F.F.Jr,	W.H.Freeman& Co	3rd Edition	1978

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	Coursera	https://www.coursera.org/learn/remote-sensing	M1, M4, M6
2	European Space Agency	https://eoscience.esa.int/landtraining2017/files/materials/D2T3P.pd	M5
3	NASA	https://appliedsciences.nasa.gov/sites/default/files/2022-11/Fundamentals_of_RS_Edited_SC.pd	M1, M2
4	Swayam	https://onlinecourses.nptel.ac.in/noc22_ce84	M1 – M6

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Professional Elective I (Computer Vision)							**Course Code:** PEC- CTMME1016		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1	Study the image formation models and feature extraction for computer vision	L1, L2, L3
2	Identify the segmentation and motion detection and estimation techniques	L1, L2, L3, L4
3	Develop small applications and detect the objects in various applications	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy
1	**Introduction** Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel, Stereo vision	08	L1, L2, L3

2	**Edge detection** Image representations (continuous and discrete), Edge linking, corner detection, texture, binary shape analysis, boundary pattern analysis, circle and ellipse detection, Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.	07	L1, L2, L3, L4
3	**Shape Representation and Segmentation** Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multi-resolution analysis, Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation	07	L1, L2, L3, L4
4	**Motion Detection and Estimation** Regularization theory, Optical computation, Stereo Vision, Motion estimation, Background Subtraction and Modelling, Optical Flow, KLT, Spatio Temporal Analysis, Dynamic Stereo; Motion parameter estimation, Structure from motion, Motion Tracking in Video	08	L1, L2, L3, L4
5	**Object recognition** Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Shape priors for recognition	08	L1, L2, L3, L4
6	**Applications of Computer Vision** Automated Visual Inspection, Inspection of Cereal Grains, Surveillance, In-Vehicle Vision Systems, CBIR, CBVR, Activity Recognition, computational photography, Biometrics, stitching and document processing	07	L1, L2, L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Computer Vision - A modern approach	D. Forsyth and J. Ponce	Pearson Prentice Hall	2nd Edition	2012
2	Computer Vision: Algorithms and Applications	Szeliski, Richard	SpringerVerlag London Limited	1st Edition	2011
3	Multiple View Geometry in Computer Vision	Richard Hartley and Andrew Zisserman	Cambridge University Press	2nd Edition	2004
4	Introduction to Statistical Pattern Recognition	K. Fukunaga	Morgan Kaufmann	2nd Edition	1990
5	Digital Image Processing	Rafael C. Gonzalez and Richard E. Woods	Prentice Hall	3rd Edition	2008
6	Computer and Machine Vision: Theory, Algorithms, Practicalities	E. R. Davies	Elsevier Inc	4th Edition	2012

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	Swayam	https://onlinecourses.nptel.ac.in/noc23_ee78	M1- M6
2	Swayam	https://onlinecourses.nptel.ac.in/noc21_ee78	M2-M5

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M.E. Semester I
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M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Professional Elective I (Energy Audit and Management)							**Course Code:** PEC- CTMME1017		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Objective: To understand the importance of energy security for sustainable development and the fundamentals of energy conservation. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management To relate the data collected during performance evaluation of systems for identification of energy saving opportunities.

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's Taxonomy
1	To identify and describe present state of energy security and its importance.	L1
2	To identify and describe the basic principles and methodologies adopted in energy audit of any utility.	L1, L2, L3
3	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.	L1, L2, L3, L4
4	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities	L1, L2, L3, L4
5	To analyze the data collected during performance evaluation and recommend energy saving measures	L1, L2, L3
6	To understand the concept of Energy conservation measures in building complex	L1

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels as per Bloom's Taxonomy
1	**Energy Scenario & Energy Conservation measures**	05	L1, L2
	Present Energy Scenario		
	Renewable and Non-Renewable form of Energy		
	Greenhouse Gas effect, Acid Rain, Energy Pricing, Energy Sector Reforms,		
	Energy Conservation and its Importance: Energy Conservation Act-2001 and its features. Role of Bureau of Energy Efficiency (BEE), Energy Security, Basic idea of Material and Energy balance		
2	**Energy Audit & Energy Economics**	08	L1, L2, L3
	Energy Audit: Definition, need, types of energy audit, Steps of detailed Energy Audit, Role of Energy Manager and Internal audit Team,		
	Measuring instruments & Equipment used during Energy audit		
	Understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement,		
	Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution		
	Elements of monitoring & targeting, Data and information analysis.		
	Energy Economics: Simple payback period (SPP), Net Present value (NPV), Return on investment (ROI), Internal rate of return (IRR)		
3	**Energy Management in Electrical System**	10	L1, L2, L3, L4
	Electricity billing, Basic concept of Electrical load management, Maximum demand Control, Energy management through Power factor improvement		
	Energy efficient equipment and appliances, Star ratings of Electrical Equipment.		
	Lighting System control: Occupancy sensors, daylight integration, and use of intelligent controllers. Energy efficiency measures in lighting system		
	Energy conservation opportunities in water pumps, industrial drives, induction motors, soft starters, variable speed drives.		
4	**Energy Management in Thermal Systems**	10	L1. L2, L3, L4
	Review of different thermal loads, Steam System: Basic idea of Steam distribution system, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system, Energy conservation in Steam distribution system,		

	Boiler System: General fuel conservation measures in Boilers and furnaces, Waste heat recovery, cogeneration, use of insulation- types and application.		
	HVAC system: Coefficient of performance, Capacity, factors affecting performance of Refrigeration and Air Conditioning system performance, Energy savings opportunities in HVAC system.		
5	**Energy Performance Assessment**	06	L1, L2, L3,
	Performance assessment of Motors, variable speed drive, pumps,		
	Lighting System calculations: Installed Load Efficacy Ratio (ILER) method,		
	HVAC system calculations; various terms used in assessment of performance		
6	**Energy conservation in Residential and Commercial Buildings**	06	L1, L2
	Energy Conservation Building Codes (ECBC)		
	Green Building norms, LEED ratings of buildings, Use of renewable energy sources in building complex		
	Total	**45**	

Books and Reference:

Sr.No.	Title	Authors	Publisher
1.	Handbook of Electrical Installation Practice	Geofry Stokes	Blackwell Science
2.	Designing with light: Lighting System Handbook	By Anil Valia	-
3.	Energy Management handbook	W.C. Turner	John Wiley and Sons
4.	Handbook on Energy Audits and Management	A. K. Tyagi,	Tata Energy Research Institute (TERI).
5.	Energy Management Principles	C.B. Smith	Pergamon Press
6.	Energy Conservation Guidebook	Dale R. Patrick, S. Fardo, Ray E. Richardson	Fairmont Press
7.	Handbook of Energy Audits	Albert Thumann, W. J. Younger, T. Niehus	CRC Press

Online Reference:

Sr. No.	Website Name	URL	Modules Covered
1	Bureau of Energy Efficiency	https://beeindia.gov.in/content/energy-auditors	M1, M2
2	You tube	https://youtube/7hDyLuFJ0c8	M1-M6
3	You tube	https://www.youtube.com/watch?v=UhGZRoUlr8U	M1-M6
4	NPTEL by IIT Roorkee	https://www.youtube.com/watch?v=2zWt-pBCU2I	M1-M3

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M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Program Elective I (Industrial Product Design)							**Course Code:** PEC- CTMME1018		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Objective: To understand the fundamental principles of industrial product design and to develop skills in conceptualizing and visualizing product designs. Also, to learn the use of computer-aided design (CAD) tools. This course will also explore materials and manufacturing processes relevant to product design and will engage in hands-on projects that simulate real-world design challenges.

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's Taxonomy
1	Explain the key principles and processes in industrial product design.	L1
2	Develop and communicate design concepts effectively using sketches and CAD tools.	L1, L2, L3
3	Apply ergonomics and user-centered design principles in product development.	L1, L2, L3, L4
4	Evaluate and select appropriate materials and manufacturing processes for product designs.	L1, L2, L3, L4
5	Create prototypes and conduct basic testing and evaluation of product designs.	L1, L2, L3
6	Work effectively in teams to manage design projects and present their outcomes.	L1

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels as per Bloom's Taxonomy
1	**Introduction to Industrial Product Design**	05	L1, L2
	History and evolution of product design, Key principles and processes in industrial design, Introduction to design thinking		

2	**Design Process and Concept Development** Ideation techniques, Sketching and concept visualization, User-centered design and ergonomics	09	L1, L2, L3
3	**Computer-Aided Design (CAD)** Introduction to CAD software (e.g., SolidWorks, AutoCAD), 3D modeling techniques, Creating technical drawings	10	L1, L2, L3, L4
4	**Materials and Manufacturing Processes** Overview of materials (metals, plastics, composites), Manufacturing techniques (injection moulding, CNC machining, 3D printing), Material selection criteria	10	L1. L2, L3, L4
5	**Prototyping and Testing** Types of prototypes (physical, virtual), Prototyping methods and tools, Basic testing and evaluation techniques	06	L1, L2, L3,
6	**Design for Sustainability and Project Management** Sustainable design principles, life cycle assessment, Eco-friendly materials and processes, Project planning and management tools	05	L1, L2
	Total	**45**	

Books and References:

Sr.No.	Title	Authors	Publisher	Edition	Year
1	Industrial Design for Engineers	W. H. Mayall	London Hiffee books Ltd	First	1967
2	Problems of Product Design and Development	Hearn Buck	Pergamon Press	First	-
3	Industrial Designs in Engineering	Charles H. Fluerichem	-	First	-
4	Material of Invention: Materials and Design	Ezio Manzini	The MIT Press	First	1989
5	The Science of Engineering Design	Percy H. Hill	Holt, Rinehart and Winston Publication	First	1970

Online References:

Sr.No.	Website Name	URL	Modules Covered
1	NPTEL	https://onlinecourses.nptel.ac.in/noc21_me83	M1, M2
2	NPTEL	NPTEL	M2-M5
3	Swayam	https://onlinecourses.nptel.ac.in/noc23_me52	M5, M6

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M.E. Semester I
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M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Program Elective I (Graph Theory & Optimization Techniques)							**Course Code:** PEC-CTMME1019		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Objective: To develop analytical capability and to impart knowledge in graphs, linear programming problem and statistical methods and their applications in engineering & technology and to apply their concepts in engineering problems they would come across.

Course Outcomes: Students should be able to:

Sr. No.	**Course Outcomes**	**Cognitive levels as per Bloom's taxonomy**
1	Understand graphs and linear programming problems	L1, L2
2	Apply statistical concepts in solving the Engineering problems.	L1, L2, L3
3	Design graph algorithms for networking.	L1, L2, L3
4	Optimize complex networking problems.	L1, L2, L3, L4
5	Analyze and design the mathematical models with linear and integer programming.	L1, L2, L3, L4
6	Use statistical and optimization methods for problem solving.	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy
1	**Basics of Graph Theory:** Introduction to Telecom Network Management: Graphs-Data structures for graphs, Subgraphs, Operations on Graphs, Connectivity Networks and the maximum flow, Minimum cut theorem, Trees, Spanning trees, Rooted trees, Matrix representation of graphs.	8	L1, L2
2	**Classes of Graphs:** Eulerian graphs and Hamiltonian graphs, Standard theorems, Planar graphs, Euler's formula, Five color theorem, Coloring of graphs, Chromatic number (vertex and edge) properties and examples, Directed graphs.	8	L1, L2, L3
3	**Graph Algorithms:** Computer Representation of graphs Basic graph algorithms, Minimal spanning tree algorithm, Kruskal and Prim's algorithm, Shortest path algorithms, Dijsktra's algorithm, DFS and BFS algorithms	8	L1, L2, L3
4	**Optimization Techniques:** Linear programming, Graphical methods, Simplex method (Artificial variables not included), Transportation and assignment problems	8	L1, L2, L3, L4
5	**Integer Programming:** Integer linear programming, Concept of cutting plane method, Mixed integer programming; Solution, algorithms; Examples	7	L1, L2, L3, L4
6	**Applications of Linear Programming**: Use of software for solving linear optimization problems using graphical and simplex method, Examples for transportation, assignment, water resources, structural and other optimization problems	6	L1, L2, L3, L4
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Graph Theory with Applications to Engineering and Computer Science	Narsingh Deo	PHI	5th Edition	2010
2	Engineering Optimization: Theory and Practice	Rao S.S.	New Age International Pvt. Ltd	3rd Edition	1998

Online References:

Sr.No.	Website Name	URL	Modules Covered
1	https://math.libretexts.org/	9.5: Graph Optimization - Mathematics LibreTexts	M3
2	Indian Statistical Institute, Bangalore	Graph_Theory_B2_Notes.pdf (isibang.ac.in)	M1-M3
3	Swayam	Advanced Graph Theory - Course (nptel.ac.in)	M1-M3
4	Optimization Theory and Algorithms - NPTEL (IIT Madras)	https://nptel.ac.in/courses/110107157	M4, M5, M6

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M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Program Elective-2 (Wireless and Mobile Communication)							**Course Code:** PEC- CTMME1021		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Objective: The students should be able to apply frequency-reuse concept in mobile communications, and analyze its effects on interference, system capacity, handoff techniques. The students should be able to distinguish various multiple-access techniques for mobile communications e.g. FDMA, TDMA, CDMA, and their advantages and disadvantages. The students should be able to analyze path loss and interference for wireless telephony and their influences on a mobile-communication system's performance. The students should be able to analyze need of equalizers in receivers in mobile communication system. The students should be able to analyze CDMA system functioning with knowledge of forward and reverse channel details, advantages and disadvantages of using the technology. The students should be able to describe upcoming technologies like 3G, 4G etc.

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1	Apply frequency-reuse concept in mobile communications, and to analyze its effects on interference, system capacity, handoff techniques	L1, L2, L3
2	Distinguish various multiple-access techniques for mobile communications e.g. FDMA, TDMA, CDMA, and their advantages and disadvantages	L1, L2, L3, L4
3	Analyze path loss and interference for wireless telephony and their influences on a mobile- communication system's performance.	L1, L2, L3, L4
4	Analyze need of equalizers in receivers in mobile communication system.	L1, L2, L3, L4
5	Analyze CDMA system functioning with knowledge of forward and reverse channel details, advantages and disadvantages of using the technology	L1, L2, L3, L4
6	Apply the concepts of 3G technologies of UMTS and CDMA 2000 and elaborate the principles of 3GPP LTE and VoLTE	L1, L2, L3

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy
1	Cellular Communication Fundamentals: Cellular system design, Frequency reuse, cell splitting, handover concepts, Co channel and adjacent channel interference, interference reduction techniques and methods to improve cell coverage, Frequency management and channel assignment. GSM architecture and interfaces, GSM architecture details, GSM subsystems, GSM Logical Channels, Data Encryption in GSM, Mobility Management, Call Flows in GSM.2.5 G Standards: High speed Circuit Switched Data (HSCSD), General Packet Radio Service (GPRS), 2.75 G Standards: EDGE.	08	L1, L2, L3
2	Spectral efficiency analysis based on calculations for Multiple access technologies: TDMA, FDMA and CDMA, Comparison of these technologies based on their signal separation techniques, advantages, disadvantages and application areas.	07	L1, L2, L3, L4
3	Mobile Radio Propagation: Large Scale Path Loss, Free Space Propagation Model, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Signal Penetration into Buildings. Small Scale Fading and Multipath Propagation, Impulse Response Model, Multipath Measurements, Parameters of Multipath channels, Types of Small Scale Fading: Time Delay Spread; Flat, Frequency selective, Doppler Spread; Fast and Slow fading.	08	L1, L2, L3, L4
4	Equalization, Diversity: Equalizers in a communications receiver, Algorithms for adaptive equalization, diversity techniques, space, frequency diversity, Interleaving.	07	L1, L2, L3, L4
5	Code Division Multiple Access: Introduction to CDMA technology, IS 95 system Architecture, Air Interface, Physical and logical channels of IS 95, Forward Link and Reverse link operation, Physical and Logical channels of IS 95 CDMA, IS 95 CDMA Call Processing, soft Handoff, Evolution of IS 95 (CDMA One) to CDMA 2000, CDMA 2000 layering structure.	08	L1, L2, L3, L4
6	Higher Generation Cellular Standards:3G Standards: evolved EDGE, enhancements in 4G standard, Architecture and representative protocols, call flow for LTE, VoLTE, UMTS, introduction to 5G.	07	L1, L2, L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Principle and Application of GSM	V.K.Garg, J.E.Wilkes	Pearson Education	5th Edition	2008
2	IS-95 CDMA & CDMA 2000	V.K.Garg	Pearson Education	4th edition	2009
3	Wireless Communications Principles and Practice	T.S.Rappaport	PHI	2nd edition	2002
4	Mobile Cellular Telecommunications Analog and Digital Systems	William C.Y.Lee	TMH,	2nd edition	1995
5	A GSM system Engineering	Asha Mehrotra	Artech House Publishers Bosten, London		1997

Online References:

Sr.No.	Website Name	URL	Modules Covered
1	Swayam	https://onlinecourses.nptel.ac.in/noc23_ee79	M1-M6
2	NPTEL (IIT Madras)	https://nptel.ac.in/courses/106106167	M1-M6
3	NPTEL: Fundamentals of Wireless Communication	https://nptel.ac.in/domains/discipline/112?course=112_1	M3, M4, M5

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M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Program Elective-2 (Cognitive Radio)							**Course Code:** PEC- CTMME1022		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1	Understand the fundamental concepts of cognitive radio networks.	L1, L2, L3
2	Develop the cognitive radio, as well as techniques for spectrum holes detection that cognitive radio takes advantages in order to exploit it.	L1, L2, L3, L4
3	Understand technologies to allow an efficient use of TVWS for radio communications based on two spectrum sharing business models/policies.	L1, L2, L3, L4
4	Understand fundamental issues regarding dynamic spectrum access, the radio-resource management and trading, as well as a number of optimisation techniques for better spectrum exploitation.	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy
1	Introduction to Cognitive Radios: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing,	08	L1, L2, L3
2	Spectrum Sensing: Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market).	06	L1, L2, L3, L4

3	Optimization Techniques of Dynamic Spectrum Allocation: Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, stochastic programming.	08	L1, L2, L3, L4
4	Dynamic Spectrum Access and Management: Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols.	08	L1, L2, L3, L4
5	Spectrum Trading: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential).	08	L1, L2, L3, L4
6	Research Challenges in Cognitive Radio: Network layer and transport layer issues, crosslayer design for cognitive radio networks.	07	L1, L2, L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Dynamic Spectrum Access and Management in Cognitive Radio Networks	Ekram Hossain, Dusit Niyato, Zhu Han	Cambridge University Press		2009
2	Cognitive radio networks	Kwang-Cheng Chen, Ramjee Prasad	John Wiley & Sons Ltd		2009
3	Cognitive radio technology	Bruce Fette	Elsevier	2nd edition	2009
4	Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems	Huseyin Arslan	Springer		2007
5	Optimizing Wireless Communication Systems	Francisco Rodrigo Porto Cavalcanti, Soren Andersson	Springer		2009
6	Essentials of Cognitive Radio	Linda Doyle	Cambridge University Press		2009

Online References:

Sr.No.	Website Name	URL	Modules Covered
1	https://rcet.org.in/	UNIT 1 notes.pdf (rcet.org.in)	M1
2	Udemy	https://www.udemy.com/course/cognitive-radio-networks/?couponCode=LEARNNOWPLANS	M1, M2, M3, M4, M5

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Program Elective-2 (Internet of Things)							**Course Code:** PEC- CTMME1023		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Prerequisite: Under graduate subjects related to Embedded System and Communication.

Course Objective: This course is organized in a way to help students to grasp the basic concepts of Internet of Things It describes the IoT communication, it's building block and operating system requirement. Lastly it covers IoT applications, security and legal considerations.

Course Outcomes: At the end of this course, students will be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's Taxonomy
1	Understand what IoT technologies are used for today, and what is required in certain scenarios.	L1, L2
2	Understand the types of technologies that are available and in use today and can be utilized to implement IoT solutions.	L1, L2
3	Apply these technologies to tackle scenarios in teams of using an experimental platform for implementing prototypes and testing them as running applications.	L1, L2, L3

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's Taxonomy
1	Smart cities and IoT revolution, Fractal cities, From IT to IoT, M2M and peer networking concepts, Ipv4 andIPV6.	08	L1, L2
2	Software Defined Networks SDN, From Cloud to Fog and MIST networking for IoT communications, Principles of Edge/P2P networking, Protocols to support IoT communications, modular design and abstraction, security and privacy in fog.	08	L1, L2
3	Wireless sensor networks: introduction, IOT networks (PAN, LAN and WAN), Edge resource pooling and caching, client side control and configuration.	04	L1, L2, L3
4	Smart objects as building blocks for IoT, Open source hardware and Embedded systems platforms for IoT, Edge/gateway, IO drivers, C Programming, multithreading concepts.	08	L1, L2, L3
5	Operating systems requirement of IoT environment, study of mbed, RIoT, and Contiki operating systems, Introductory concepts of big data for IoT applications.	10	L1, L2
6	Applications of IoT, Connected cars IoT Transportation, Smart Grid and Healthcare sectors using IoT, Security and legal considerations, IT Act 2000 and scope for IoT legislation.	10	L1, L2, L3

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Internet of Things- Hands on approach	A Bahaga, V. Madisetti	VPT publisher		2014
2	Designing the Internet of Things	A. McEwen, H. Cassimally	Wiley		2013
3	Getting started with Internet of Things	CunoPfister	Maker Media	1st edition	2011
4	Internet of things	Samuel Greenguard	MIT Press		2015

Online References:

Sr.No.	Website Name	URL	Modules Covered
1	https://rcet.org.in/	UNIT 1 notes.pdf (rcet.org.in)	M1
2	FutureLearn	https://www.futurelearn.com/courses/smart-cities	M1
3	Coursera	https://www.coursera.org/learn/smart-cities	M6

M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							M.E. (SEM: I)		
Course Name: Program Elective-2 (JTFA and MRA)							**Course Code:** PEC- CTMME1024		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1.	Introduction to Transforms in signal processing	L1, L2, L3
2.	To understand Time -Frequency Analysis & Multiresolution Analysis	L1, L2, L3, L4
3.	Study of Wavelets and its Applications	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's
1	Introduction Review of Fourier Transform, Parseval Theorem and need for joint time-frequency Analysis. Concept of non-stationary signals, Short-time Fourier transforms (STFT), Uncertainty Principle, and Localization/Isolation in time and frequency, Hilbert Spaces, Banach Spaces, and Fundamentals of Hilbert Transform.	08	L1, L2, L3
2	Bases for Time-Frequency Analysis: Wavelet Bases and filter Banks, Tilings of Wavelet Packet and Local Cosine Bases, Wavelet Transform, Real Wavelets, Analytic Wavelets, Discrete Wavelets, Instantaneous Frequency, Quadratic time-frequency energy, Wavelet Frames, Dyadic wavelet Transform, Construction of Haar and Roof scaling function using dilation equation and graphical method.	06	L1, L2, L3, L4

3	Multiresolution Analysis: Haar Multiresolution Analysis, MRA Axioms, Spanning Linear Subspaces, nested subspaces, Orthogonal Wavelets Bases, Scaling Functions, Conjugate Mirror Filters, Haar 2-band filter Banks, Study of up samplers and down samplers, Conditions for alias cancellation and perfect reconstruction, Discrete wavelet transform and relationship with filter Banks, Frequency analysis of Haar 2-band filter banks, scaling and wavelet dilation equations in time and frequency domains, case study of decomposition and reconstruction of given signal using orthogonal framework of Haar 2band filter bank.	0	L1, L2, L3, L4
4	Wavelets: Daubechies Wavelet Bases, Daubechies compactly supported family of wavelets; Daubechies filter coefficient calculations, Case study of Daub-4 filter design, Connection between Haar and Daub-4, Concept of Regularity, Vanishing moments. Other classes of wavelets like Shannon, Meyer, and Battle-Lamarie.	08	L1, L2, L3, L4
5	Bi-orthogonal wavelets and Applications: Construction and design. Case studies of biorthogonal 5/3 tap design and its use in JPEG 2000. Wavelet Packet Trees, Time-frequency localization, compactly supported wavelet packets, case study of Walsh wavelet packet bases generated using Haar conjugate mirror filters till depth level 3. Lifting schemes for generating orthogonal bases of second generation wavelets.	08	L1, L2, L3, L4
6	JTFA Applications: Riesz Bases, Scalograms, Time-Frequency distributions: fundamental ideas, Applications: Speech, audio, image and video compression; signal denoising, feature extraction, inverse problem.	07	L1, L2, L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	A Wavelet Tour of Signal Processing	S. Mallat	Academic Press	2nd Edition	1999
2	Time-frequency analysis	L. Cohen	Prentice Hall	1st Edition	1995
3	Wavelets and Filter Banks	G.Strang and T. Q. Nguyen	Wellesley Cambridge Press	2nd Edition	1998
4	Ten Lectures on Wavelets	I. Daubechies	SIAM		1992
5	Multirate Systems and Filter Banks	P. P. Vaidyanathan	Prentice Hall		1993
6	Wavelets and Subband Coding	M. Vetterli and J. Kovacevic,	Prentice Hall		1995

Online References:

Sr.No.	Website Name	URL	Modules Covered
1	https://rcet.org.in/	UNIT 1 notes.pdf (rcet.org.in)	M1
2	MIT OpenCourseWare	https://ocw.mit.edu/courses/18-327-wavelets-filter-banks-and-applications-spring-2003/	M2, M3, M4, M5, M6

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Program Elective-2 (Voice and Data Networks)							**Course Code:** PEC- CTMME1025		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1	Protocol, algorithms, trade-offs rationale.	L1, L2, L3
2	Routing, transport, DNS resolutions	L1, L2, L3, L4
3	Network extensions and next generation architectures	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy
1	Network Design Issues, Network Performance Issues, Network Terminology, centralized and distributed approaches for networks design, Issues in design of voice and data networks.	08	L1, L2, L3
2	Layered and Layer less Communication, Cross layer design of Networks, Voice Networks (wired and wireless) and Switching, Circuit Switching and Packet Switching, Statistical Multiplexing.	06	L1, L2, L3, L4
3	Data Networks and their Design, Link layer design- Link adaptation, Link Layer Protocols, Retransmission. Mechanisms (ARQ), Hybrid ARQ (HARQ), Go Back N, Selective Repeat protocols and their analysis.	08	L1, L2, L3, L4

4	Queuing Models of Networks , Traffic Models , Little's Theorem, Markov chains, M/M/1 and other Markov systems, Multiple Access Protocols , Aloha System , Carrier Sensing , Examples of Local area networks	07	L1, L2, L3, L4
5	Inter-networking, Bridging, Global Internet IP protocol and addressing, Subnetting, Classless Inter Domain Routing (CIDR), IP address lookup, Routing in Internet. End to End Protocols, TCP and UDP. Congestion Control , Additive Increase/Multiplicative Decrease , Slow Start, Fast Retransmit/ Fast Recovery,	08	L1, L2, L3, L4
6	Congestion avoidance, RED TCP Throughput Analysis, Quality of Service in Packet Networks. Network Calculus, Packet Scheduling Algorithms.	08	L1, L2, L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	Data Networks	D. Bertsekas and R. Gallager	Prentice Hall	2nd Edition	1992
2	Computer Networks: A Systems Approach	L. Peterson and B. S. Davie	Morgan Kaufman	5th Edition	2011
3	Communication Networking: An analytical approach	Kumar, D. Manjunath and J. Kuri	Morgan Kaufman	1st Edition	2004.
4	Communications Network: A First Course	Walrand	McGraw Hill	2nd Edition	2002.
5	Queueing Systems,Volume I: Theory	Leonard Kleinrock	John Wiley and Sons	1st Edition	1975
6	Telecommunication Network Design Algorithms	Aaron Kershenbaum	McGraw Hill	--	1993
7	Design and Analysis of Computer Communication Networks	Vijay Ahuja	McGraw Hill	--	1987

Online References:

Sr.No.	Website Name	URL	Modules Covered
1	https://faculty.kfupm.edu.sa	voicdata (kfupm.edu.sa)	M1
2	Swayam	https://onlinecourses.nptel.ac.in/noc21_cs18	M1-M6

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)								M.E. (SEM: I)	
Course Name: Program Elective-2 (Audio Video Coding & Compression)								**Course Code:** PEC- CTMME1026	
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Outcomes: Students should be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's taxonomy
1	Familiarity to lossy and lossless compression systems.	L1, L2, L3
2	Study of Video coding techniques and standards.	L1, L2, L3, L4
3	Understand audio coding and multimedia synchronization techniques.	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's taxonomy
1	Introduction to Multimedia Systems and Processing, Lossless Image Compression Systems Image Compression Systems, Huffman Coding, Arithmetic and Lempel-Ziv Coding, Other Coding Techniques	08	L1, L2, L3
2	Lossy Image Compression Systems, Theory of Quantization, Delta Modulation and DPCM, Transform Coding & K-L Transforms, Discrete Cosine Transforms, Multi-Resolution Analysis, Theory of Wavelets, Discrete Wavelet Transforms, Still Image Compression Standards: JBIG and JPEG	06	L1, L2, L3, L4
3	Video Coding and Motion Estimation: Basic Building Blocks & Temporal Redundancy, Block based motion estimation algorithms, Other fast search motion estimation algorithms	08	L1, L2, L3, L4

4	Video Coding Standards MPEG-1 standards, MPEG-2 Standard, MPEG-4 Standard, H.261, H.263 Standards, H.264 standard	07	L1, L2, L3, L4
5	Audio Coding, Basic of Audio Coding, Audio Coding, Transform and Filter banks, Polyphase filter implementation , Audio Coding, Format and encoding, Psychoacoustic Models	08	L1, L2, L3, L4
6	Multimedia Synchronization, Basic definitions and requirements, References Model and Specification, Time stamping and pack architecture, Packet architectures and audio-video interleaving, Multimedia Synchronization, Playback continuity, Video Indexing And Retrieval: Basics of content based image retrieval, Video Content Representation, Video Sequence Query Processing	08	L1, L2, L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	H.264 and MPEG-4 Video Compression	Iain E.G. Richardson	Wiley	--	2003
2	Introduction to Data Compression	Khalid Sayood	Morgan Kaufmann	4th Edition	2012
3	Standard Codecs: Image Compression to Advanced Video Coding	Mohammed Ghanbari	The Institution of Engineering and Technology	3rd Edition	2011
4	Spectral Audio Signal Processing	Julius O. Smith III	W3K Publishing	--	2011
5	Tools for Signal Compression: Applications to Speech and Audio Coding	Nicolas Moreau	Wiley	--	2011

Online References:

Sr.No.	Website Name	URL	Modules Covered
1	Stanford University	https://gfxcourses.stanford.edu/cs348k/spring23content/media/videocompression/10_videocompression.pdf	M1
2	NPTEL	https://archive.nptel.ac.in/courses/117/105/117105083	M1-M6

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Program Elective-2 (Digital Marketing)							**Course Code:** PEC- CTMME1027		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral/ Presentation**	**Term Work**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours **ESE: End Semester Examination - Paper Duration - 3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Objective: The course will transform you into a complete digital marketer with expertise in the top eight digital marketing domains — search engine optimization, social media, pay-per-click, conversion optimization, digital analytics, content, mobile, and email marketing. Fast-track your career in digital marketing today with practical training you can apply on the job.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels as per Bloom's Taxonomy
1	Understand Digital Business Models	L1,L2
2	Understand A.I. and machine learning terminologies, mind-set and its applicationin marketing	L1,L2
3	Build sophisticated machine learning models – learn how to gather and clean data,select an algorithm, train, evaluate and deploy a model	L1,L2
4	Predict churn, sales or score leads with tools	L1,L2,L5
5	Segment customers; build clustering models to drive personalization.	L1,L2,L5,L6
6	Build computer vision models for social visual listening, use natural languageprocessing to predict consumption preferences.	L2,L5

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels as per Bloom's Taxonomy
1	**Introduction - Digital Marketing** Digital Marketing Skills empowered by AI :SEO, Search Engine Marketing, Social Media Marketing, Web Analytics, Email Marketing, Content Marketing, Influencer Marketing, Conversion Rate Optimization, Tools Based Marketing, Lifecycle Marketing Automation.	7	L1,L2
2	**Full Funnel Marketing** **Acquisition:** Content marketing, landing page testing, campaign optimization, conversion rate optimization, lead scoring, competition and trend analysis, predict sales, optimize product pricing, programmatic media buying, segmentation and clustering for targeting, personalization. **Activation** Personalization, psychographic segmentation, behavioral segmentation **Retention** Predict churn, customer care chatbot, sentiment analysis, visual sociallistening, personalization **Revenue** Predict and maximize customer lifetime value, recommender systems,market basket analysis **Referral** Predict whether user recommend your product	8	L1,L2,L3
3	**Marketing framework and tools** **Planning:** Hubspot, Bright edge, Node, Crayon, Equals3, Marketmuse, Pathmatics, Caliber mind, Alegion, Netra **Production:** Acrolinx, Narrative Science, Clarifai, Gum Gum, phrasee,curate Attention insight **Personalization:** Uberflip, Klevu, Seventh Sense, Blueshift, **Promotion:** Yext, Albert, one spot, Cortex, Sift rock, in Powered **Performance :**Monkeylearn, PaveAI,	8	L1,L2,L3,L5
4	**Predictive Analytics** Fundamentals of predictive analytics, Prediction model for lead scoring and sales forecasting, churn prediction model, Predictive modelling for customer behavior, automated segmentation	7	L1,L2,L3,L5
5	**Psychographics, NLP and Computer Vision** Customer psychographics, leveraging personality traits to predict consumption preferences using NLP, Detect emotions, assign labels, understand text from images, detect news events, logos using ComputerVision	7	L1,L2,L3,L5
	Futuristic Marketing	8	L2,L3

6	IoTs Augmented Reality, Virtual Reality and XR for Marketing, Blockchain and smart contracts for marketing, NeuroMarketing, WearableTech, Personal Chatbots		
	Total	**45**	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Artificial intelligence marketing and predictingconsumer choice: an overview of tools and techniques	Struhl, S.	Kogan Page Publishers	Third	2017
2	AI for Marketing and Product Innovation: Powerful New Tools for Predicting Trends, Connecting with Customers, and Closing Sales.	Appel, A., Sthan unathan, S., Pradeep, A. K.	Wiley.	Third	2018
3	Artificial intelligence for marketing: practicalapplications	Sterne, J.	John Wiley & Sons	Fourth	2017..
4	Using Artificial Intelligence in Marketing:How to harness AI and maintain the competitive edge.	King, K.	Kogan Page Publishers	First	2019

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	https://www.iimcal.ac.in/	https://iimcal.talentsprint.com/ai-powered-marketing/index.html?utm_source=googlesearch&utm_medium=cpc&utm_campaign=iimc-aipm- googlesearch-india&utm_content=ai-in-marketing-by-iimc&gclid=CjwKCAjwyo36BRAXEiwA24CwG VQrXnOTpcARRsFtvt8b9VAPqwV7KGPFmPyx36i1Zafl_7Br1OJEEhoChC4QAvD_BwE/	M1,M2,M3,M4,M5,M6
2	https://www.coursera. org/	https://www.coursera.org/learn/uva-darden-market-analytics	M4,M5,M6

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Program Elective-2 (Digital Business Management)							**Course Code :** PEC- CTMME1028		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral(25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1 Hours ESE: End Semester Examination - Paper Duration - 3 Hours **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Data Structure, Software Engineering									

Course Objective: Students will be introduced to digital transformation and e-commerce in businesses, market places analysis, digital business support services, digital business management, strategy and materializing digital businesses.

Course Outcome: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive Levels as per Blooms Taxonomy
1	Understand digital business management, and describe e-marketplaces and challenges.	L1,L2
2	Describe e-commerce strategy and implementation, and the legal, ethical, and societal impacts of EC	L1,L2,L3
3	Describe digital business support services: ERP and Building digital business applications.	L1,L2,L3
4	Understand managing risks in e–business security threats to e-business –Security.	L1,L2,L3
5	Describe the process of digital transformation	L1,L2,L3
6	Discuss materializing the e-business.	L1,L2,L3

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive Levels as per Bloom Taxonomy
1	**Introduction:** 1.1 Introduction, Background, and Current Status, E-market places, structures, mechanisms, economics, and impacts Difference between physical economy and digital economy. 1.2 Drivers of digital business- Big Data and analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things (digitally intelligent machines/services) 1.3 Opportunities and Challenges in Digital Business.	7	L1,L2
2	**Overview of E-Commerce** **2.1 Overview of E-Commerce** E-Commerce- Meaning, Retailing in e-commerce-products and services,consumer behavior, market research, and advertisement B2B-E-commerce-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business EC, and Corporate portals 2.2 Other E-C models and applications, innovative EC Systems E-government and learning to C2C, mobile commerce, and pervasive computing EC Strategy and Implementation-EC strategy and global EC, Economics, and Justification of EC 2.3 **Using Affiliate marketing to promote your e-commerce business,** Launching a successful online business and EC project, Legal, Ethics, and Societal impacts of EC	8	L1,L2,L3
3	**Digital Business Support services** 3.1Digital Business Support Services: ERP as e-business backbone, knowledge Tope Apps, Information and referral system 3.2Application Development: Building Digital Business Applications and Infrastructure	7	L1,L2,L3
4	**Managing E-Business** 4.1 Managing E-Business-Managing Knowledge 4.2 Managing Risks in e-business Security Threats to e-business - Security Overview, Electronic Commerce Management skills for e-business, Threats, Encryption, Cryptography, Public Key and Private	8	L1, L2,L3

	Key Cryptography, Digital Signatures, Digital Certificates, Security Protocols over Public Networks: HTTP, SSL, Firewall as Security Control, Public Key Infrastructure (PKI) for Security, Prominent Cryptographic Applications.		
5	**E-Business Strategy-** 5.1 E-Business Strategy-E-business Strategic formulation- Analysis of the Company's Internal and external environment, Selection of strategy. 5.2 E-business strategy into Action, challenges, and E-Transition (Process of Digital Transformation).	7	L1,L2,L3
6	**Materializing e-business** 6.1 Materializing e-business: From Idea to Realization-Business Plan Preparation. 6.2 Case Studies and Presentations.	8	L1,L2,L3
	Total	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	A textbook on E-commerce	Er Arunrajan Mishra, Dr W K Sarwade	Neha Publishers & Distributors	1st	2011
2	E-commerce from vision to fulfilment	Elias M. Awad,	PHI-Restricted,	1st	2002
3	Digital Business and E-Commerce Management	Ed, Dave Chaffey,	Pearson,	1st	August 2014
4	Introduction to E-business-Management and Strategy,	Colin Combe,	ELSVIER	1st	2006
5	Digital Business Concepts and Strategy,	Eloise Coupey	Pearson	2nd Edition,	2009
6	Trend and Challenges in Digital Business Innovation,	VinocenzoMorabito,	Springer	1st	
7	Digital Business	Discourse Erika Darics	Palgrave Macmillan	1st	April 2015

Online Resources:

Sr. No.	Website Name	URL	Modules Covered
1	SpringerLink	https://www.coursera.org/specializations/big-data Introduction to E-Marketplaces, Structures, Mechanisms, Economics, and Impacts; Overview of E-Commerce; Digital Business Support Services	M1, M2, M3
2	Coursera	https://www.coursera.org/specializations/big-data Drivers of Digital Business: Big Data and Analytics	M1
3	Khan Academy	https://www.khanacademy.org/computing/computer-science/cryptography Managing E-Business: Cryptography	M4
	Coursera	https://www.coursera.org/learn/strategy-implementation	M5
	Wharton Online	https://online.wharton.upenn.edu/	M5
	Udemy	https://www.udemy.com/course/the-complete-business-plan-course/?couponCode=NVDIN35	M6

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

M. E. (Communication Technology & Management)							**M.E. (SEM: I)**		
Course Name: Program Elective-2 (Project Management)							**Course Code :** PEC- CTMME1029		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**100**
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1 Hours ESE: End Semester Examination - Paper Duration - 3 Hours									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Data Structure, Software Engineering									

Course Objective: The objective of the course is to familiarize the students with the use of a structured methodology/approach for each and every unique project undertaken, including utilizing project management concepts, tools and techniques and appraise the students with the project management life cycle and make them knowledgeable about the various phases from project initiation through closure.

Course Outcomes: Upon completion of the course students will be able to:

Sr No.	Course Outcomes	Cognitive levels as per Bloom's Taxonomy
1	Apply selection criteria and select an appropriate project from different options	L1, L2, L3, L4
2	Write work break down structure for a project and develop a schedule based on it	L1, L2, L3, L4
3	Identify opportunities and threats to the project and decide an approach to deal with them strategically.	L1, L2, L3, L4
4	Use Earned value technique and determine & predict status of the project.	L1, L2, L3, L4
5	Compare and contrast various project execution, Monitoring and Controlling Projects, Project Contracting, Project Leadership and Ethics and Closing the Project	L1, L2, L3, L4
6	Capture lessons learned during project phases and document them for future reference	L1, L2

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per Bloom's Taxonomy
1	**Project Management Foundation** Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical), Project phases and stage gate process. Role of project manager, Negotiations and resolving conflicts, Project management in various organization structures, PM knowledge areas as per Project Management Institute (PMI).	6	L1, L2, L3, L4
2	**Initiating Projects** How to get a project started, Selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter; Project proposal. Effective project team, Stages of team development & growth (forming, storming, norming & performing), team dynamics	6	L1, L2, L3, L4
3	**Project Planning and Scheduling** Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT, CPM, GANTT chart, Introduction to Project Management Information System (PMIS).	8	L1, L2, L3, L4
4	**Planning Projects** Crashing project time, Resource loading and levelling, Goldratt's critical chain, Project Stakeholders and Communication plan, **Risk Management in projects**: Risk management planning, Risk identification and risk register, Qualitative and quantitative **risk assessment**, Probability and impact matrix. Risk response strategies **for positive and negative risks**	8	L1, L2, L3, L4
5	**Executing Projects, Monitoring and Controlling Projects & ProjectContracting** **Executing Projects**: Planning monitoring and controlling cycle, Information needs and reporting, engaging with all stakeholders of the projects, Team management, communication and project meetings **Monitoring and Controlling Projects**: Earned Value Management techniques for measuring value of work completed; Using milestones for measurement; change requests and scope creep, Project audit. **Project Contracting**: Project procurement management, contracting and outsourcing,	10	L1, L2, L3, L4
	Project Leadership and Ethics & Closing the Project		

6	**Project Leadership and Ethics**: Introduction to project leadership, ethicsin projects, Multicultural and virtual projects **Closing the Project**: Customer acceptance; Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), **Processof project termination**, completing a **final report**; doing a lesson learned analysis; acknowledging successes and failures; Project management templates and other resources; Managing without authority; **Areas of further study.**	7	L1, L2
	Total	**45**	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Project Management Foundation:	Project Management: A managerial approach, Jack Meredith & Samuel Mantel.	Wiley India	Seventh Edition	2009
2	Initiating Projects & ProjectPlanning and Scheduling	A Guide to the Project Management Body of Knowledge (PMBOK® Guide)	Project Management Institute PA, USA	Fifth Edition	--
3	Planning Projects	Project Management, Gido Clements	Cengage Learning	--	--
4	Executing Projects, Monitoring and ControllingProjects & Project Contracting	Project Management, GopalanWiley India	Wiley India	--	--
5	Project Leadership and Ethics& Closing the Project	Project Management, DennisLock.	Gower Publishing England	Ninth Edition	--

Online Resources:

Sr. No.	Website Name	URL	Modules Covered
1	http://www.opentextbooks.org.hk	http://www.opentextbooks.org.hk/system/files/export/15/15694/pdf/Project_Management_15694.pdf	M1-M6
2	https://www.nesac enter.org	https://www.nesacenter.org/uploaded/conferences/SEC/2014/handouts/Rick_Detwiler/15_Detwiler_Resources.pdf	M1-M3, M6
3	http://www.edo.ca	http://www.edo.ca/downloads/project-management.pdf	M1,M4

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

ME (Communication Technology & Management)							**SEM :** I		
Course Name : Computational Lab1: Advanced Communication Networks Laboratory							**Course Code :** LC- CTMME101		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week					**Theory (100)**		**Practical/Oral (25)**	**Term Work (50)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**PR/OR**	**TW**	**50**
-	-	4	4	2	-	-	25	25	

Each Laboratory assignment will be done by an individual student. The Faculty teaching core subject will be required to propose the respective Laboratory assignments. These will be essentially hands-on practical /Case Study

Course Outcomes: At the end of this course, students will be able to

- Identify the different types of network devices and their functions within a network.
- Understand and build the skills of sub-netting and routing mechanisms.
- Understand basic protocols of computer networks, and how they can be used to assist in network design and implementation.

Suggested list of Assignments:

1. Study of Networking Commands (Ping, Tracert, TELNET, nslookup, netstat, ARP, RARP) and Network Configuration Files.
2. Linux Network Configuration.
    a. Configuring NIC's IP Address.
    b. Determining IP Address and MAC Address using if-config command.
    c. Changing IP Address using if-config.
    d. Static IP Address and Configuration by Editing.
    e. Determining IP Address using DHCP.
    f. Configuring Hostname in /etc/hosts file.
3. Design TCP iterative Client and Server application to reverse the given input sentence.
4. Design a TCP concurrent Server to convert a given text into upper case using multiplexing system call "select".
5. Design UDP Client Server to transfer a file.
6. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to automatically serve Windows and Linux OS Binaries based on client MAC address.
    a. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverse DNS and

forward DNS, using TCP dump/Wireshark characterize traffic when the DNS server is up and when it is down.

7. Configure a mail server for IMAP/POP protocols and write a simple SMTP client in C/C++/Java client to send and receive mails.
8. Configure FTP Server on a Linux/Windows machine using a FTP client/SFTP client characterise file transfer rate for a cluster of small files 100k each and a video file of 700mb.Use a TFTP client and repeat the experiment.
9. Signaling and QoS of labeled paths using RSVP in MPLS.
10. Find shortest paths through provider network for RSVP and BGP.
11. Understand configuration, forwarding tables, and debugging of MPLS.

Department of Electronics and Telecommunication Engineering
M.E. Semester I
Choice Based Credit Grading Scheme (CBCGS 2024)

ME (Communication Technology & Management)							SEM : I		
Course Name : Computational Lab2: Wireless and Mobile Communication Laboratory							Course Code : LC- CTMME102		
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (50)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	
-	-	4	4	2	-	-	25	25	50

Each Laboratory assignment will be done by an individual student. The Faculty teaching core subject will be required to propose the respective Laboratory assignments. These will be essentially hands-on practical /Case Study

Course Outcomes: At the end of this course, students will be able to

- Understanding Cellular concepts, GSM and CDMA networks
- To study GSM handset by experimentation and fault insertion techniques
- Understating of 3G communication system by means of various AT commands usage in GSM
- Understanding CDMA concept using DSSS kit
- To learn, understand and develop concepts of Software Radio in real time environment

Suggested list of Assignments:

1. Understanding Cellular Fundamentals like Frequency Reuse, Interference, cell splitting, multi path environment, Coverage and Capacity issues using communication software.

2. Knowing GSM and CDMA architecture, network concepts, call management, call setup, call release, Security and Power Control, Handoff Process and types, Rake Receiver etc.

3. Study of GSM handset for various signalling and fault insertion techniques (Major GSM handset sections: clock, SIM card, charging, LCD module, Keyboard, User interface).

4. To study transmitters and receiver section in mobile handset and measure frequency band signal and GMSK modulating signal.

5. To study various GSM AT Commands their use and developing new application using it. Understating of 3G Communication System with features like; transmission of voice and video calls, SMS, MMS, TCP/IP, HTTP, GPS and File system by AT Commands in 3G network.

6. Study of DSSS technique for CDMA, observe effect of variation of types of PN codes, chip rate, spreading factor, processing gains on performance.

7. To learn and develop concepts of Software Radio in real time environment by studying the building blocks like Base band and RF section, convolution encoder, Interleaver and De- Interleaver.

8. To study and analyze different modulation techniques in time and frequency domain using SDR kit.