TECHNO INDIA UNIVERSITY

WEST BENGAL

M.Tech in Electronics & Communication Engineering

Syllabus

2024-25

FIRST SEMESTER

Program: M. Tech. in ECE	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: Advanced Communication Network	**Subject Code:** TIU-PEC-T111
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

Enable the student to: Provide an in-depth understanding of Internet protocols, real-time communication, TCP/IP, MPLS, and packet scheduling.

COURSE OUTCOME:

CO Number	Course Outcome (CO)	
CO1	Understand the concepts, challenges, and history of the Internet, and the fundamentals of TCP/IP and ATM.	K2
CO2	Analyze congestion and flow control in TCP, including throughput and fairness in high bandwidth delay networks.	K4
CO3	Evaluate real-time communication challenges over the Internet, including adaptive applications, and traffic management techniques like RSVP and LBAP.	K3
CO4	Understand and apply packet scheduling algorithms (GPS, WFQ) and active queue management techniques (RED, WRED) for high-speed networks.	K4
CO5	Analyze IP address lookup techniques, flow identification, and packet classification algorithms in the context of Internet traffic management.	K4
CO6	Understand MPLS architecture, protocols, and IP tunneling techniques, and evaluate traffic engineering issues in MPLS-based networks.	K2

COURSE CONTENT:

MODULE 1:	**Internet and TCP/IP Concepts**	**12 Hours**
Overview of the Internet, ATM, TCP/IP, congestion and flow control, and fairness in TCP.		
MODULE 2:	**Real-Time Communication and Packet Scheduling**	**14 Hours**
Adaptive applications, intServ, RSVP, packet scheduling algorithms, active queue management.		
MODULE 3:	**IP Addressing, MPLS, and Admission Control**	**14 Hours**

IP address lookup, packet classification, MPLS, IP tunneling, IP switching, and Differentiated Services in the Internet.	
TOTAL LECTURES	**40 Hours**

Books:

1. Jean WairandandPravinVaraiya,"HighPerformanceCommunicationsNetworks",2nd edition, 2000.
2. Jean Le Boudec and Patrick Thiran," Network Calculus A Theory of Deterministic Queueing Systems for the Internet", Springer Veriag, 2001.
3. ZhangWang,"InternetQoS",MorganKaufman,2001.
4. Anurag Kumar, D.Manjunath and Joy Kuri, "Communication Networking : An Analytical Approach" , Morgan Kaufman Publishers, 2004.
5. GeorgeKesidis,"ATMNetworkPerformance",KluwerAcademic,ResearchPapers, 2005.

Program: M. Tech. in ECE	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: Wireless and Mobile Communication	**Subject Code:** TIU-PEC-T113
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

Enable the student to: provide a comprehensive understanding of cellular communication systems, GSM and CDMA technologies, mobile radio propagation, equalization techniques, and advancements in 3G, 4G, and 5G cellular standards.

COURSE OUTCOME

CO Number	Course Outcome (CO)	
CO1	Design appropriate mobile communication systems.	K4
CO2	Apply frequency-reuse concept in mobile communications, and to analyze its effects on interference, system capacity, handoff techniques	K4
CO3	Distinguish various multiple-access techniques for mobile communications e.g. FDMA, TDMA, CDMA, and their advantages and disadvantages.	K4
CO4	Analyze path loss and interference for wireless telephony and their influences on a mobile- communication system's performance.	K4

CO5	Analyze and design CDMA system functioning with knowledge of forward and reverse channel details, advantages and disadvantages of using the technology	K4
CO6	Understanding upcoming technologies like 4G, 5G etc.	K2

COURSE CONTENT:

MODULE 1:	Cellular Communication and GSM Architecture	**14Hours**
Cellular system design, frequency reuse, handover, GSM architecture, logical channels, data encryption, 2.5G and 2.75G standards.		
MODULE 2:	Mobile Radio Propagation and Multiple Access Technologies	**12 Hours**
TDMA, FDMA, CDMA, link budget, large-scale path loss, fading, propagation models.		
MODULE 3:	CDMA, Equalization, and Advanced Cellular Standards	**15 Hours**
IS 95, CDMA 2000, soft handoff, equalization techniques, 3G, 4G, LTE, VoLTE, 5G introduction.		
TOTAL LECTURES		**41 Hours****

Books:

1. T.S.Rappaport,"Wireless Communications Principles and Practice",2nd edition,Prentice Hall, 2002.
2. G.S.Stüber,"PrinciplesofMobileCommunications",3rd edition,Springer,2013.
3. M.K.Simon and M.-S.Alouni,"Digital Communications over Fading Channels", Wiley, 2002.
4. M.Plätzold,"Mobile Fading Channels",Wiley, 2002.
5. A.J.Goldsmith,"Wireless Communications",Cambridge,2005.
6. A.F.Molisch,"Wireless Communications",Wiley, 2011.
7. D.TseandP.Viswanath,"Fundamentals of Wireless Communications",Cambridge,2005.
8. R.Prasad, "OFDM for Wireless Communication Systems", Artech House, 2004.
9. S.Haykin and M.Moher, "Modern Wireless Communications",Pearson,2011.
10. V.K.GargandJ.E.Wilkes, "Principle and Application of GSM", Pearson Education,5th edition, 2008.
11. V.K.Garg,"IS-95 CDMA & CDMA 2000",Pearson Education,4th edition,2009.
12. WilliamC.Y.Lee, "Mobile Cellular Telecommunications Analog and Digital Systems",2nd edition, Tata McGraw Hill, 1995.
13. Asha Mehrotra,"AGSM system Engineering"Artech House Publishers Bosten,London, 1997.
14. A.K.Jagannatham, "Principles of Modern Wireless Communication Systems", McGrawHill, 2015.
15. I. Saha Misra,"Wireless Communication and Networks",Prentice Hall of India,2010.
16. S.Kumar,"Wireless Communication Fundamentals and Advanced Concepts",River

Publications, 2015.
17. J.G.Proakis and M.Salehi, “DigitalCommunications”, McGrawHill, 5th edition, 2008.

Program: M. Tech. in ECE	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: Wireless Sensor Networks	**Subject Code:**TIU-PEC-E1011
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

The course aims to provide knowledge on wireless sensor network architecture, hardware, protocols, programming tools, data management, and specialized features such as energy efficiency, security, and emerging research challenges in wireless sensor networks.

COURSE OUTCOME:

CO Number	Course Outcome (CO)	
CO1	Understand the architecture and design of sensor networks and differentiate them from traditional Ad Hoc networks.	K2
CO2	Explore various hardware platforms and operating systems used in sensor networks such as MicaZ, TelosB, TinyOS, and Contiki.	K2
CO3	Gain practical experience in programming tools such as C and nesC, and evaluate the performance of wireless sensor networks using simulation tools like ns-2, QualNet, and Opnet.	K3
CO4	Analyze and understand different sensor network protocols, including physical, MAC, and routing layers, and explore key protocols like 802.15.4, Bluetooth, BLE, and UWB.	K4
CO5	Examine data dissemination, storage, and query processing techniques in sensor networks and how they differ from traditional database management systems.	K4
CO6	Address key challenges in sensor networks such as energy efficiency, security, fault tolerance, localization, connectivity, and explore future research trends and enabling technologies.	K2

COURSE CONTENT:

MODULE 1:	**Sensor Network Architecture and Applications**	**12 Hours**
Introduction to sensor networks, architecture, comparison with Ad Hoc networks, sensor node hardware, and software details.		
MODULE 2:	**Wireless Sensor Network Tools**	**15 Hours**
Programming tools (C, nesC), performance comparison of wireless sensor network simulators like ns-2 and commercial platforms.		
MODULE 3:	**Protocols and Specialized Features**	**15 Hours**
Overview of sensor network protocols, energy efficiency, security challenges, fault tolerance, and future research directions in sensor networks.		
TOTAL LECTURES		**42 Hours**

Books:

1. H.Karl and A.Willig, "Protocols and Architectures for Wireless Sensor Networks",John Wiley & Sons, India, 2012.
2. C.S.Raghavendra, K.M.Sivalingam, and T.Znati ,Editors,"Wireless Sensor Networks", Springer Verlag, 1 st Indian reprint, 2010.
3. F.ZhaoandL.Guibas,"Wireless Sensor Networks: An Information Processing Approach", Morgan Kaufmann, 1 st Indian reprint, 2013.
4. YingshuLi,MyT.Thai,WeiliWu,"Wireless sensor Network and Applications", Springer series on signals and communication technology, 2008.

Program: M. Tech. in ECE	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: Statistical Information Processing	**Subject Code:**TIU-PEC-E1115
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

The course aims to provide an in-depth understanding of Statistical Information Processing, focusing on spectrum sensing, dynamic spectrum allocation, and access, as well as optimization techniques, spectrum trading, and the emerging research challenges in cognitive radio networks.

COURSE OUTCOME:

CO Number	Course Outcome (CO)	
CO1	Characterize and apply probabilistic techniques in modern decision systems, such as information systems, receivers, filtering and statistical operations.	K4
CO2	Demonstrate mathematical modeling and problem solving using such models.	K3

CO3	Comparatively evolve key results developed in this course for applications to signal processing, communications systems.	K3
CO4	Develop frameworks based on probabilistic and stochastic themes for modeling and analysis of various systems involving functionalities in decision making, statistical inference, estimation and detection.	K2
CO5	Communicate statistical findings through clear and concise reports, presentations, and visualizations.	K4
CO6	Present statistical analysis in a way that is understandable for both technical and non-technical audiences.	K3

COURSE CONTENT:

MODULE 1:	Introduction	**12 Hours**
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, Tchebychef inequality theorem, Central Limit theorem, Discrete & Continuous Random Variables.		
MODULE 2:	Random signal modelling:	**8 Hours**
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.		
MODULE 3:	Statistical Decision Theory:	**14 Hours**
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		
MODULE 4:	Information Theory and Source Coding:	**8 Hours**
Introduction, Uncertainty, Information and Entropy, Source coding theorem, Huffman, Shannon Fano, Arithmetic, Adaptive coding, RLE, LZW Data compaction, , LZ-77, LZ-78. Discrete Memory less channels, Mutual information, channel capacity, Channel coding theorem,		
TOTAL LECTURES		**42 Hours**

References Books:

1. R.G.Gallager,"Information Theory and Reliable Communication",Wiley,1stedition, 1968.
2. T.M.CoverandJ.A.Thomas, "Elements of Information Theory",Wiley, 2nd edition,2006.
3. A.Papoulis and S.U.Pillai,"Probability, Random Variables and Stochastic Processes",4th Edition, McGraw-Hill, 2002.
4. R.Bose,"Information Theory, Coding and Cryptography",TataMcGrawHill,2nd edition, 2008.

Program: M. Tech. in ECE	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: Cognitive Radio	**Subject Code:** TIU-PEC-E1031
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

The course aims to provide an in-depth understanding of cognitive radio systems, focusing on spectrum sensing, dynamic spectrum allocation, and access, as well as optimization techniques, spectrum trading, and the emerging research challenges in cognitive radio networks.

COURSE OUTCOME:

CO Number	Course Outcome (CO)	
CO1	Understand the architecture, functions, and components of cognitive radios, including concepts such as dynamic spectrum access (DSA) and spectrum sensing.	K2
CO2	Analyze and apply techniques for spectrum sensing and detection of spectrum holes, including collaborative sensing and geo-location database models.	K4
CO3	Explore various optimization techniques for dynamic spectrum allocation, such as linear, convex, and stochastic programming, to optimize spectrum usage.	K3
CO4	Investigate dynamic spectrum access and management techniques, including centralized and distributed architectures, and the application of learning algorithms and protocols.	K4
CO5	Understand and classify spectrum trading models, radio resource pricing strategies, and discuss relevant economic theories such as utility and auction theory.	K2
CO6	Examine the research challenges in cognitive radio networks, focusing on network layer, transport layer issues, and cross-layer design approaches.	K4

COURSE CONTENT:

MODULE 1:	Introduction to Cognitive Radios	**12 Hours**
Overview of cognitive radio architecture, dynamic spectrum access, spectrum sensing, analysis, decision-making, and applications.		

MODULE 2:	Spectrum Sensing and Business Models	**13 Hours**
Spectrum holes detection, collaborative sensing, geo-location database, spectrum sharing business models, and secondary spectrum market.		
MODULE 3:	Dynamic Spectrum Management and Trading	**14 Hours**
Dynamic spectrum access, learning algorithms, protocols, spectrum trading, auction theory, and radio resource pricing.		
TOTAL LECTURES		**39 Hours****

Books:

1. EkramHossain,DusitNiyato, Zhu Han,"Dynamic Spectrum Access and Management in Cognitive Radio Networks", Cambridge University Press, 2009.
2. Kwang-ChengChen,RamjeePrasad,"Cognitive radio networks",JohnWiley&SonsLtd., 2009.
3. Bruce Fette,"Cognitive radio technology",Elsevier,2ndedition, 2009.
4. HuseyinArslan,"CognitiveRadio,Software Defined Radio,andAdaptiveWireless Systems", Springer, 2007.
5. Francisco Rodrigo Porto Cavalcanti, Soren Andersson,"OptimizingWirelessCommunication Systems" Springer, 2009.
6. LindaDoyle,"EssentialsofCognitiveRadio",CambridgeUniversityPress,2009

Program: M. Tech. in ECE	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: RF & Microwave Circuit Design	**Subject Code:** TIU-PEC-E1133
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** 3

COURSE OBJECTIVE:

Enable the student to:

1. Understand transmission line theory and impedance matching techniques.
2. Analyze microwave network parameters and their applications in signal processing.
3. Design and evaluate microwave components, amplifiers, and semiconductor devices.

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	**Explain** the lumped element circuit model for transmission lines and analyze the impedance matching techniques using Smith charts and quarter-wave transformers.	K4
CO-2:	**Analyze** microwave network parameters such as impedance, admittance, scattering, and transmission matrices, and their applications in signal flow graphs.	K4
CO-3:	**Design** and **evaluate** microwave components like resonators, filters, power dividers, and directional couplers for specific frequency and performance requirements.	K4

CO-4:	**Analyze** the impact of nonlinearity and time variance on communication systems, including inter-symbol interference, noise, sensitivity, dynamic range, and distortion.	K4
CO-5:	**Identify** and **compare** different microwave semiconductor devices (PIN diode, varactor diode, Schottky diode, GaAs FET, MESFET, etc.) and their applications in high-frequency systems.	K1. K4
CO-6:	**Design** amplifiers (low noise, high power, and broadband) and **analyze** their performance using power gain equations, impedance matching techniques, and stability criteria.	K4

COURSE CONTENT:

MODULE 1:	**Transmission Line Theory**	**6 Hours**
Introduction to lumped element circuit models, transmission line theory, Smith chart usage, quarter-wave transformers, impedance matching techniques, generator and load mismatch, and field analysis for transmission line applications.		
MODULE 2:	**Microwave Network Analysis**	**8 Hours**
Study of impedance and admittance matrices, equivalent voltage/current analysis, scattering matrix, transmission matrix, and signal flow graphs to analyze microwave networks and their applications in communication and signal transmission.		
MODULE 3:	**Microwave Components**	**10 Hours**
Explore microwave resonators, filters, power dividers, directional couplers, and ferromagnetic devices, focusing on their design, operational principles, and usage in high-frequency communication systems.		
MODULE 4:	**Nonlinearity and Time Variance**	**6 Hours**
Examine the effects of nonlinearity and time variance in communication systems, including inter-symbol interference, random processes, noise, sensitivity, dynamic range, conversion gain, and distortion.		
MODULE 5:	**Microwave Semiconductor Devices and Modeling**	**8 Hours**
Study of semiconductor devices like PIN diodes, varactor diodes, Schottky diodes, IMPATT/TRAPATT, microwave BJTs, GaAs FETs, MESFETs, MOSFETs, and HEMTs, focusing on their modeling and high-frequency applications.		
MODULE 6:	**Amplifier Design**	**7 Hours**
Design of amplifiers, including power gain equations, stability analysis, impedance matching, constant gain and noise figure circles, and the design of small-signal, low-noise, high-power, and broadband amplifiers, along with oscillator and mixer design.		
TOTAL LECTURES		**45 Hours****

Books:

1. "RF Circuit Design: Theory and Applications" by Reinhold Ludwig, Gene Bogdanov ISBN: 978-0131471375
2. "Microwave Engineering" by David M. Pozar ISBN: 978-1119356036
3. "Microwave Circuit Design: A Practical Approach Using ADS" by Kyung-WhanYeom ISBN: 978-1119910283
4. "The Design of CMOS Radio-Frequency Integrated Circuits" by Thomas H. Lee ISBN: 978-0521835398

5. "Microwave and RF Design: A Systems Approach" by Michael Steer ISBN: 978-1608452845
6. "Microwave Circuit Design Using Linear and Nonlinear Techniques" by George D. Vendelin, Anthony M. Pavio, Ulrich L. Rohde ISBN: 978-0471212465
7. "RF and Microwave Circuit Design for Wireless Communications" by Lawrence E. Larson ISBN: 978-1580535021

Program: M. Tech. in ECE	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: Research Methodology and IPR	**Subject Code:** TIU-PMG-T121
Contact Hours/Week: 2–0–0 (L–T–P)	**Credit:** 2

COURSE OBJECTIVE:

This course aims to introduce research problem formulation, effective literature review, ethical considerations, technical writing skills, and understanding of intellectual property rights (IPR), including patents, trademarks, and copyright. It explores new developments and international cooperation in IPR, with practical case studies.

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	**Understanding Research Fundamentals** – Explain the fundamentals of research problems, including their sources, criteria, data collection methods, and analysis techniques.	K2
CO-2:	**Identifying and Formulating Research Problems** – Demonstrate the ability to identify and formulate effective research problems while avoiding common pitfalls.	K3
CO-3:	**Conducting Literature Review and Ethical Research** – Analyze and synthesize literature effectively while adhering to research ethics and avoiding plagiarism.	K4
CO-4:	**Understanding Intellectual Property Rights (IPR)** – Describe various types of intellectual property, including patents, trademarks, and copyrights, and their significance in research and innovation.	K2
CO-5:	**Navigating the Patent Process** – Illustrate the process of patent filing, licensing, and international cooperation in intellectual property protection.	K3
CO-6:	**Developing Ethical and Legal Research Skills** – Apply ethical research practices, ensuring credibility, originality, and adherence to legal frameworks in academic and industrial research.	K3

COURSE CONTENT:

MODULE 1:	**Research Problem & Methodology**	**12 Hours**
Understanding research problems, sources, criteria, data collection, analysis, and investigation approaches. Identifying good research problems and avoiding common errors.		
MODULE 2:	**Literature & Research Ethics**	**14 Hours**
Approaches to literature study, analysis, and plagiarism. Emphasizing research ethics for credible, ethical research practices.		
MODULE 3:	**Intellectual Property & Patents**	**13 Hours**
Overview of Intellectual Property (patents, trademarks, copyrights), patenting processes, licensing, and international cooperation in IPR.		
TOTAL LECTURES		**39 Hours**

Books:

1Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2 ndEdition , "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.
6. Niebel, "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

Program: M. Tech. in ECE	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: English for Research Paper Writing	**Subject Code:** TIU-PEC-A10X
Contact Hours/Week: 2–0–0 (L–T–P)	**Credit:** 0

COURSE OBJECTIVE:

This course aims to introduce research problem formulation, effective literature review, ethical considerations, technical writing skills, and understanding of intellectual property rights (IPR), including patents, trademarks, and copyright. It explores new developments and international cooperation in IPR, with practical case studies.

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	Develop skills in structuring paragraphs and sentences, enhancing clarity by using proper word order, breaking long sentences, and removing ambiguity and redundancy.	K3

CO-2:	Understand techniques to highlight key findings, clarify authorship, paraphrase effectively, and avoid plagiarism while writing sections like abstracts and introductions.	K2
CO-3:	Review and critically analyze literature, and effectively present methods, results, discussions, and conclusions in academic papers.	K2
CO-4:	Acquire the key skills necessary for writing the title, abstract, and introduction, and enhance the ability to write a comprehensive literature review.	K2
CO-5:	Learn and apply skills for writing methods, results, discussions, and conclusions with precision and clarity, maintaining coherence in scientific writing.	K2
CO-6:	Use useful phrases for academic writing and understand how to prepare a research paper for first-time submission, ensuring a high standard of quality.	K3

COURSE CONTENT:

MODULE 1:	**Writing Structure and Clarity**	**12 Hours**
Planning, sentence structure, paragraphing, conciseness, avoiding ambiguity, and improving clarity in academic writing.		
MODULE 2:	**Academic Paper Sections**	**14 Hours**
Skills for writing titles, abstracts, introductions, literature reviews, methods, and results effectively.		
MODULE 3:	**Final Checks & Paper Quality**	**14 Hours**
Useful phrases, plagiarism avoidance, and ensuring quality for first-time paper submission.		
TOTAL LECTURES		**40 Hours**

Books:

1Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

Program: M. Tech. in ECE	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: Constitution of India	**Subject Code:**TIU-PEC-A10X
Contact Hours/Week: 2–0–0 (L–T–P)	**Credit:** 2

COURSE OBJECTIVE:

Enable the student to:

1. Provide awareness of fundamental rights, duties, and directive principles.
2. Discuss the constitutional framework for the functioning of democracy in India.

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	Explain the structure and key provisions of the Constitution of India.	K4
CO-2:	Understand the significance of Fundamental Rights, Directive Principles, and Fundamental Duties.	K3
CO-3:	Describe the functioning of the Parliament, Judiciary, and Executive under the Indian Constitution.	K3
CO-4:	Analyze the federal structure and the distribution of powers between the Union and States.	K2
CO-5:	Identify the role of the Constitution in shaping social and political norms.	K4
CO-6:	Interpret the relevance of the Constitution in the functioning of democracy in India.	K4

COURSE CONTENT:

MODULE 1: History of Making of the Indian Constitution	**4 Hours**
History Drafting Committee, (Composition & Working)	
MODULE 2: Philosophy of the Indian Constitution	**4 Hours**
Preamble Salient Features.	
MODULE 3: Contours of Constitutional Rights & Duties	**5 Hours**
Fundamental Rights Right to Equality Right to Freedom Right against Exploitation Right to Freedom of Religion Cultural and Educational Rights Right to Constitutional Remedies Directive Principles of State Policy Fundamental Duties.	
MODULE 4: Organs of Governance	**5 Hours**
Parliament Composition Qualifications and Disqualifications Powers and Functions Executive President Governor Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications Powers and Functions	
MODULE 5: Local Administration	**6 Hours**
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	

MODULE 6: Election Commission	6 Hours
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.	
TOTAL LECTURES	**30 Hours**

Books:

1. The Constitution of India,1950(BareAct),Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015
3. M.P.Jain,Indian Constitution Law,7th Edn.,LexisNexis,2014.
4. D.D.Basu,Introduction to the Constitution of India,Lexis Nexis, 2015.

Program: M.Tech. in ECE	**Year, Semester:** 1ST, 1ST SEM
Course Title: Advanced Communication Networks Lab	**Subject Code:**TIU-PEC- L111
Contact Hours/Week: 0–0–3	**Credit:** 2

COURSE OBJECTIVE:

Enable the student to:

1. Configure and integrate DHCP and BOOTP servers to assign IP addresses dynamically and serve OS binaries based on MAC addresses.

2. Set up DNS services, including caching, proxying, and reverse DNS lookups, and analyze network traffic using tcpdump and Wireshark.

3. Set up and manage mail servers using IMAP/POP protocols and develop SMTP clients for sending and receiving emails.

COURSE OUTCOME:

On completion of the course, the student will be able:

CO-1	Understanding Networking Commands & Configuration	K2
CO-2	Implementation of TCP and UDP-based Client-Server Applications	K3
CO-3	Configuration and Management of Network Services	K3
CO-4	Setup and Analysis of Email and File Transfer Services	K3

CO-5	MPLS and Quality of Service (QoS) Implementation	K3
CO-6	Routing and Network Path Optimization	K4

COURSE CONTENT:

MODULE 1:	Study of Networking Commands & Network Configuration Files	**9 Hours**
Understanding **Ping, Tracert, TELNET, nslookup, netstat, ARP, RARP** commands. Exploring important **network configuration files** in Linux and Windows.		
MODULE 2:	Linux Network Configuration	**9 Hours**
Configuring **NIC's IP Address** (Static and Dynamic). Using **ip-config** to determine and change IP/MAC addresses. Editing configuration files to set a **static IP address**. Configuring **hostname** in /etc/hosts.		
MODULE 3:	Design a TCP Iterative Client-Server Application	**6 Hours**
Develop a **TCP-based** iterative client-server program. Reverse the given input sentence received from the client.		
MODULE 4:	Design a UDP Client-Server to Transfer a File	**6 Hours**
Implement a **UDP-based file transfer** system. Ensure reliable delivery of files over an unreliable transport layer.		
MODULE 5:	Configure a DHCP Server	**6 Hours**
Serve **contiguous IP addresses** to a pool of four devices. Set up **default gateway and DNS** for clients. Integrate **BOOTP daemon** for automatic OS binary distribution. Capture network traffic using **tcpdump/Wireshark** for analysis.		
MODULE 6:	Configure an FTP Server	**9 Hours**
Setup and test an **FTP/SFTP server** on Linux/Windows. Measure file transfer performance for **small files (100 KB) and a large file (700 MB)**. Compare performance using a **TFTP client**.		
TOTAL LAB HOURS		**45 Hours**

Books:

1. **Linux for Networking Professionals: Securely configure and operate Linux network services for the enterprise" by Rob VandenBrink**

This book offers in-depth insights into Linux networking configurations, tools, and services. It covers both modern and legacy commands, focusing on Command Line Interface tools, making it suitable for professionals aiming to enhance their networking skills.

2. **"Internetworking with TCP/IP Volume III: Client-Server Programming and Applications, BSD Socket Version" by Douglas E. Comer**

This volume addresses the design of applications using TCP/IP, focusing on the client-server paradigm. It examines algorithms for both client and server components of distributed programs and includes detailed example implementations that have been tested under Linux.

3. **"Linux Network Administrator's Guide" by Olaf Kirch and Terry Dawson**

This guide provides comprehensive coverage of setting up and running Unix and Linux networks. It includes sections on configuring networking hardware, TCP/IP networking, DNS, and various network applications, making it a valuable resource for understanding Linux network configuration and management.

4. **"Unix Network Programming, Volume 1: The Sockets Networking API" by W. Richard Stevens, Bill Fenner, and Andrew M. Rudoff**

This authoritative guide delves into socket programming, covering both TCP and UDP protocols. It's highly recommended for understanding the intricacies of network communication and developing robust client-server applications.

Program: MTech. in ECE	**Year, Semester:** 1ST, 1ST SEM
Course Title: Wireless and Mobile Communication Laboratory	**Subject Code: TIU-PEC- L113**
Contact Hours/Week: 0–0–3	**Credit:** 2

COURSE OBJECTIVE:

Enable the student to:

1. **Understanding Cellular Communication Fundamentals** – Gain knowledge of key cellular concepts such as frequency reuse, interference, cell splitting, multipath environments, and network coverage and capacity issues using communication software.

2. **Implementing GSM AT Commands for Applications** – Explore the use of GSM AT Commands to develop applications involving voice and video calls, SMS, MMS, TCP/IP, HTTP, GPS, and file systems in 3G networks.

.**COURSE OUTCOME:**

On completion of the course, the student will be able:

CO-1	Understand Cellular Communication Principles	K2
CO-2	Analyze GSM and CDMA Network Architectures	K4
CO-3	Examine GSM Handset Components and Fault Diagnosis	K4
CO-4	Evaluate Mobile Transmitter and Receiver Performance	K4
CO-5	Implement GSM AT Commands and 3G Application	K3
CO-6	Explore Software-Defined Radio (SDR) and CDMA Techniques	K3

COURSE CONTENT:

MODULE 1:	Cellular Communication Fundamentals	**9 Hours**
● Frequency reuse and interference management ● Cell splitting and multipath environments ● Coverage and capacity issues in cellular networks ● Use of communication software for analysiS		
MODULE 2:	GSM and CDMA Network Architecture	**9 Hours**
● GSM and CDMA architecture and network concepts ● Call management, call setup, and call release ● Security, power control, and handoff processes ● Rake receiver and its role in CDMA		
MODULE 3:	GSM Handset and Signaling Techniques	**6 Hours**
● Study of GSM handset sections (Clock, SIM card, Charging, LCD, Keyboard, User Interface) ● Signaling techniques and fault insertion methods ● Transmitter and receiver section analysis ● Measurement of frequency band signals and GMSK modulation		
MODULE 4:	GSM AT Commands and 3G Communication	**6 Hours**
● GSM AT Commands and their applications ● Developing applications using AT Commands (Voice calls, SMS, MMS, TCP/IP, HTTP, GPS) ● 3G communication system and its features		
MODULE 5:	Configure a DHCP Server	**6 Hours**
● Direct Sequence Spread Spectrum (DSSS) in CDMA ● Impact of PN codes, chip rate, and spreading factor ● Processing gain and performance analysis		

MODULE 6:	Software-Defined Radio (SDR) and Modulation Techniques	**9 Hours**
● Basics of Software-Defined Radio (SDR) ● Baseband and RF sections, convolution encoder, interleaver, and de-interleaver ● Time and frequency domain analysis of different modulation techniques using SDR kit		
TOTAL LAB HOURS		**45 Hours**