

**CURRICULUM
FOR THE ACADEMIC YEAR 2024-2025**

DEPARTMENT OF COMPUTER SCIENCE ANDE NGINEERING

M.Tech. (Computer Network Engineering)

I SEMESTER Syllabus



**POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING
(An autonomous college under VTU)
KALABURAGI**

Curriculum for PG(CNE)- 24 Series Syllabus 2024-2045

About the institution: The Hyderabad Karnataka Education (HKE) society founded by Late Shri. Mahadevappa Rampure, a great visionary and educationist. The HKE Society runs 46 educational institutions. Poojya Doddappa Appa College of Engineering, Gulbarga is the first institution established by the society in 1958. The college is celebrating its golden jubilee year, setting new standards in the field of education and achieving greater heights. The college was started with 50% central assistance and 50% state assistance, and a desire to impart quality technical education to this part of Karnataka State. The initial intake was 120 with degree offered in three branches of engineering viz, Civil, Mechanical and Electrical Engineering. Now, it houses 11 undergraduate courses, 10 post Graduate courses and 12 Research centers, established in Civil Engg., Electronics & Communication Engg., Industrial & Production Engg., Mechanical Engg., Electrical Engg., Ceramic Cement Tech., Information Science & Engg., Instrumentation Technology, Automobile Engg., Computer Sc. and Engg., Mathematics and Chemistry All the courses are affiliated to Visveswaraya Technological University, Belgaum. At present the total intake at UG level is 980 and PG level 193.

The college receives grant in aid funds from state government. A number of projects have been approved by MHRD /AICTE, Govt. of India for modernization of laboratories. KSCST, Govt. of Karnataka is providing financial assistance regularly for the student's projects.

The National Board of Accreditation, New Delhi, has accredited the College in the year 2005-08 for 09 UG Courses out of which 08 courses are accredited for three years and 01 course is accredited for five years. And second time accredited for Six Course in the year 2009-2012

Our college is one among the 14 colleges selected under TEQIP, sponsored by World Bank. It has received a grant of Rs 10.454 Crores under this scheme for its development. The institution is selected for TEQIP phase II in year 2011 for four years. Institution is receiving a grant of Rs. 12.50 Crores under TEQIP Phase -II scheme for its development and selected for TEQIP-III as mentoring Institute for BIET Jhansi(UP).

Recognizing the excellent facilities, faculty, progressive outlook, high academic standards and record performance, the VTU Belgaum reposed abundant confidence in the capabilities of the College and the College was conferred Autonomous Status from the academic year 2007-08, to update its own programme and curriculum, to devise and conduct examinations, and to evaluate student's performance based on a system of continuous assessment. The academic programmes are designed and updated by a Board of Studies at the department level and Academic Council at the college level. These statutory bodies are constituted as per the guidelines of the VTU Belgaum. A separate examination section headed by a Controller of Examinations conducts the examinations.

At present the college has acquired the Academic autonomous status for both PG and UG courses from the academic year 2007-08 and it is one among the six colleges in the state of Karnataka to have autonomous status for both UG and PG courses.

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One of the unique features of our college is, it is the first college in Karnataka State to start the Electronics and Communication Engineering branch way back in the year 1967, to join NIT Surathkal and IISc, Bangalore. Also, it is the only college in the state and one among the three colleges across the country, offering a course in Ceramic and Cement Technology. This is the outcome of understanding by faculty and management about the basic need of this region, keeping in view of the available raw material and existing Cement Industries.

Bharatiya Vidya Bhavan National Award for an Engineering College having Best Overall Performance for the year 2017 by ISTE (Indian Society for Technical Education). In the year 2000, the college was awarded as Best College of the year by KSCST, Bangalore in the state level students projects exhibition.

The college campus is spread over 71 acres of land on either side of Mumbai-Chennai railway track and has a sprawling complex with gardens and greenery all around.

About the department: The Computer Science and Engineering department was started in the year 1984 with an intake of 40 students for UG. The department has seen phenomenal growth and now the department has increased UG intake to 120 students and offering two Post Graduation programmes: PG (Computer Science and Engineering with an intake of 25 students) and PG(Computer Network and Engineering with an intake of 18 students). The department is offering research program under its recognized research center. Computer Science and Design course was started from 2021 with an intake of 60 students. The department is having state-of-the-art computing facilities with high speed internet facilities and laboratories. The department library provides useful resources like books and journals. The department has well qualified and experienced teaching faculty. The department has been conducting several faculty development programs and student training programs.

Vision of the Institution

To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

Mission of the Institution

- To provide a high quality educational experience for students with values and ethics that enables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research and development activities.
- To provide beneficial service to the national and multinational industries and communities through educational, technical, and professional activities

Vision of the Department

- To become a premier department in Computer education, research and to prepare highly competent IT professionals to serve industry and society at local and global levels.

Mission of the Department

- To impart high quality professional education to become a leader in Computer Science and Engineering.
- To achieve excellence in Research for contributing to the development of the society.
- To inculcate professional and ethical behaviour to serve the industry.

Program Educational Objectives (PEO):

PEO1:	To prepare graduates with core competencies in mathematical and engineering fundamentals to solve and analyze computer science and engineering problems
PEO2:	To adapt to evolving technologies and tools for serving the society
PEO3:	To perform as team leader, effective communicator and socially responsible computer professional in multidisciplinary fields following ethical values
PEO4:	To encourage students to pursue higher studies, engage in research and to become entrepreneurs

Program Outcomes:

- 01. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 02. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 03. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 04. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 05. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 06. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 07. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 08. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 09. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

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12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

PSO1:	Acquire competency in hardware and software working principles to analyze and solve computing problems.
PSO2:	Design quality software to develop scientific and business applications following Software Engineering practices.
PSO3:	Apply cutting edge technologies using modern tools to find novel solutions ethically to existing problems.

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POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI Scheme of Teaching and Examinations – 2024 M.Tech., Computer Network Engineering (CNE) Choice Based Credit System (CBCS) and Outcome-Based Education(OBE)											
I SEMESTER											
Sl. No	Course	Course Code	Course Title	Teaching Hours per Week			Examination				Credits
				Theory	Practical/Seminar	Tutorial/ Skill Development Activities	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	T/SDA					
1	BSC/PCC	24PCN11	Linear Algebra & Probability Theory	03	00	00	03	50	50	100	3
2	IPCC/PCC/PBLC	24PCN12	Machine Learning	03	02	00	03	50	50	100	4
3	PCC	24PCN13	Cryptography and Network Security	03	00	02	03	50	50	100	4
4	PCC	24PCN14	Mobile Network Architecture	02	00	02	03	50	50	100	3
5	PCC	24PCN15	Advanced Computer Networks	02	00	02	03	50	50	100	3
6	PCCL	24PCNL16	Mobile Application Development Lab	03	00	00	03	50	50	100	2
7	PCCL	24PCNL17	Cryptography and Network Security lab	01	02	00	03	50	50	100	2
8	PCC	24SEM18	Technical Seminar	00	01	01	03	100	---	100	1
9	NCMC	24RMI19	Research Methodology and IPR (Online)	Online courses (online.vtu.ac.in)							PP
				17	05	07	24	450	350	800	22

Note: **BSC**-Basic Science Courses, **PCC**: Professional core, **IPCC**-Integrated Professional Core Courses, **NCMC**- None Credit Mandatory Course, **PCCL**-Professional Core Course lab
AUD/AEC –Audit Course / Ability Enhancement Course, **L-Lecture, P-Practical, T/SDA-Tutorial / Skill Development Activities**(Hours are for interaction between faculty and students)**PBLC**: Project Based Learning Course

Integrated Professional Core Course (IPCC): Refers to a Professional Theory Core Course Integrated with practical's of the same course. The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

Project Based Learning Course (PBLC): Project Based Learning Course is a professional core Course only Students have to complete a project out of learning from the course and SEE will be viva voce on project work.

Skill development activities:Under **Skill development activities** in a concerning course, the students should

1. Interact with industry (small, medium, and large).
2. Involve in research/testing/projects to understand their problems and help creative and innovative methods to solve the problem.
3. Involve in case studies and field visits/ fieldwork.

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4. Accustom to the use of standards/codes etc., to narrow the gap between academia and industry.
5. Handle advanced instruments to enhance technical talent.
6. Gain confidence in modeling of systems and algorithms for transient and steady-state operations, thermal study, etc.
7. Work on different software/s (tools) to simulate, analyse and authenticate the output to interpret and conclude.

All activities should enhance student's abilities to employment and/or self-employment opportunities, management skills, Statistical analysis, fiscal expertise, etc. Students and the course instructor/s to be involved either individually or in groups to interact together to enhance the learning and application skills of the study they have undertaken. The students with the help of the course teacher can take up relevant technical –activities that will enhance their skills. The prepared report shall be evaluated for CIE marks.

24RMI19-Research Methodology and IPR- None Credit Mandatory Course (NMC) if students have not studied this course in their undergraduate program then he /she has to take this course at <http://online.vtu.ac.in> and qualifying in this course is compulsory before completion of the minimum duration of the program (Two years), however, this course will not be considered for vertical progression.

Technical Seminar: Students have to finalize the technical topic for the seminar in consultation with a faculty mentor, Preparation of the seminar report, and presentation slides to be presented at the end of the semester.

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AUTONOMOUS SYLLABUS FOR M.Tech I SEMESTER 2024-2025

Course Title: LINEAR ALGEBRA AND PROBABILITY THEORY		
Subject Code: 24PCN11	Credit:3	CIE: 50
Number of Lecture Hours/Week	3:0:0 Hrs	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
Prerequisites: Probability Theory and statistics		
Course Objectives: <ul style="list-style-type: none"> • Understand concepts and theorems on probability. • Able to know statistical concepts and Techniques. • Gain Knowledge of Eigen values, Eigen vectors and stochastic matrices. • Study probabilistic behavior of queues. • Study of mathematical model for communication 		
MODULES		Teaching Hours
Module I		
Linear Algebra: System of Linear Algebraic equations by triangularization method , Cholesky method, Partitions method, Gauss Jacobi, Gauss- Seidel's method and Power method for eigen values and eigen vectors.		09 Hrs
Module II		
Vector Spaces: Geometry of system of linear equations, Vector spaces and subspaces, basis and dimension, four fundamental subspaces, Rank – Nullity theorem(without proof),linear transformation. Orthogonal Vectors and subspaces, projections and least squares, orthogonal bases and Gram-Schmidt orthogonalization .		08 Hrs
Module III		
Probability-I: Random variables, probability mass and probability distribution function, Probability distributions: Binomial, Normal and Gaussian distributions & examples.		08 Hrs
Module IV		
Probability-II: Random variables, s, joint probability distribution (discrete and continuous)-Illustrative examples, Probability vectors, stochastic matrices, fixed points, regular stochastic matrices.		09 Hrs
Module V		
Sampling Theory: Testing of hypothesis: t-distribution test, Chi square test and F-test. Analysis of Variance (ANOVA):one way classification		08 Hrs
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		

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Reference Books:

- 1.S.S .Shastry, Introductory Methods of Numerical Analysis , PHI, 2005.
- 2.David C. Lay, “Linear Algebra and its applications”, 3rd Edition , Pearson Education, 2002.
- 3.H.K. Dash , Er. Rajnish Verma, “Higher Engineering Mathematics”, S.Chand Publishers, 3rd Edition,2014
- 4.Kenneth Hoffman and Ray Kunze, “Linear Algebra”, 2nd Edition, PHI, 2011
- 5.B.S. Grewal, “Numerical Methods in Engineering & Science”, Khanna Publishers, 2015.
- 6.R.D. Sharma, “Theory and problems of Linear Algebra”,I.K. International Publishing House Pvt. Ltd, 2010

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome (CO)
24PCN11	CO1	Acquire the idea of significant figures, types of errors during numerical computation and Solve system of linear equations using direct and iterative methods.
	CO2	Estimate orthogonality of vector spaces, Cumulative distribution function and characteristic function. Recognize problems which involve these concepts in Engineering applications.
	CO3	Describe the basic notions of discrete and continuous probability distributions.
	CO4	Describe the basic notions of discrete and continuous joint probability distributions.
	CO5	Understand statistical and probabilistic concepts required to test the hypothesis

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Course Title: MACHINE LEARNING		
Subject Code: 24PCN12	Credit:4	CIE:50
Number of Lecture Hours/Week	3 Hrs (Th) + 2 Hrs (Practical)	SEE:50
Total Number of Lecture Hours	42	SEE Hours: 03
Pre-requisite: Mathematical Foundation of Computer Networks, Analysis and Design of Algorithm		
Course Objectives: <ul style="list-style-type: none"> • Understand types, concepts of learning • Design a system using various types of learning. 		
MODULES		Teaching Hours
Module –I		
<p>Introduction, Concept Learning And Decision Trees : Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.</p> <ol style="list-style-type: none"> 1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file. 2. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 		08 Hrs
Module-II		
<p>Neural Networks And Genetic Algorithms: Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning.</p> <ol style="list-style-type: none"> 1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples 2. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets. 		08 Hrs

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Module-III	
<p>Bayesian And Computational Learning: Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model.</p> <ol style="list-style-type: none"> 1. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets. 2. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API. 3. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program. 	09 Hrs
Module- IV	
<p>Instant Based Learning And Learning Set Of Rules: K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions – Case- Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution.</p> <ol style="list-style-type: none"> 1. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem. 2. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs. 	09 hrs
Module – V	
<p>Analytical Learning And Reinforced Learning: Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.</p>	08 Hrs
<p>Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.</p>	
<p>Text Books: 1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education(INDIAN EDITION),2013.</p>	

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Reference Books:

1. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd., 2013.
2. T. Hastie, R. Tibshirani, J.H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
24PCN12	CO1	Choose the learning techniques with this basic knowledge.
	CO2	Apply effectively neural networks and genetic algorithms for designing an application.
	CO3	Illustrate bayesian techniques and derive effectively learning rules.
	CO4	Describe instant based learning and rule sets.
	CO5	Choose and differentiate inforcement and analytical learning techniques

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Course Title: CRYPTOGRAPHY AND NETWORK SECURITY		
Subject Code: 24PCN13	Credit:4	CIE:50
Number of Lecture Hours/Week	3:0:2 Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours: 03
Pre-requisite: Discrete Mathematics, Computer Networks.		
Course Objectives:		
<ul style="list-style-type: none"> • Understanding the basic concepts, major issues and technologies in computer security. • Develop basic understanding of cryptography, encryption techniques and security policies. 		
MODULES		Teaching Hours
Module –I		
Introduction to Cyber Attacks : Defense Strategies and Techniques, Mathematical Background for Cryptography: Modulo Arithmetic, The Greatest Common Divisor, Useful Algebraic Structure, Chinese Remainder Theorem, Basics of Cryptography: Preliminaries Elementary Substitution Ciphers, Elementary Transposition Ciphers, Other cipher Properties.		09 Hrs
Module-II		
Secret Key Cryptography: Product Cipher, DES Construction, Modes of Operation MAC and Other Application, Attacks, Linear Cryptanalysis. Public Key Cryptography and RSA: RSA Operation, Why Does RSA Work, Performance, Application, Practical Issues. Cryptography Hash: Introduction, Properties Construction, Application and Performance, The Birthday Attacks. Discrete Logarithm and its Application: Introduction Diffie-Hellman key Exchange, Other Application.		08 Hrs
Module-III		
Elliptic Curve Cryptography and Advanced Encryption Standard: Elliptic Curve Cryptography, Application, Practical Considerations ,Advanced Encryption standard. Key Management: Introduction, Digital Certificates, public Key Infrastructure, Identity-Based Encryption. Authentication-I : One- Way Authentication, Mutual Authentication, Dictionary Attacks. Authentication-II: Centralised Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics.		09 Hrs
Module- IV		
IPsec-Security at the Network Layer: Security ay Different Layer, IPsec in Action, Internet Key Exchange (IKE) protocol, Security Policy and IPsec, Virtual Private Networks. Security at Transport Layer: Introduction SSL Handshake Protocol, SSL Record Layer Protocol. OpenSSL. IEEE 802.11 Wireless LAN Security: Background, Authentication confidentiality and Integrity. Non-Cryptography Protocol Vulnerabilities: DoS and DDoS, Session Hijacking and Spoofing, Pharming Attacks, Wireless LAN Vulnerabilities. data points. Select appropriate data set for your experiment and drawgraphs.		08 hrs
Module – V		
Firewalls: Basics, Practical Issues, Person Firewalls: A Case Study. Intrusion Prevention and Detection: Introduction, Prevention verses Detection, types of Prevention Detection system, DoS Attack Prevention/ Detection, Malware Defense. Web services Security: Motivation, Technologies for Web services, WS- services, SAML, Other Standards.		08 Hrs

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Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module.

TEXT BOOKS:

1. Bernard L.Menezes, Ravinder Kumar, “Cryptography, Network Security and Cyber Laws”, Second Edition, Cengage Learning India Pvt Ltd, 2019.

Forouzan.B.A, Debdeep Mukhopadhyay, “Cryptography and Network Security”, Second Edition, Tata McGraw-Hill, 2012.

REFERENCE BOOKS:

1. William Stallings, Cryptography and Network Security, Pearson Education, 2006

2. Alfred J. Menezes, Paul C. Van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press.

3. Neal Koblitz, A Course In Number Theory And Cryptography, Springer.

3. Johannes A. Buchmann, Introduction to Cryptography, Undergraduate Text in Mathematics, Springer.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
24PCN13	CO1	Describe cyber attacks and defence strategies and solve problems on encryption techniques.
	CO2	Explain encryption algorithms and use of hashing in security applications and apply them
	CO3	Discuss different standard encryption and authentication algorithms
	CO4	Describe security vulnerabilities at Network layer and understand security solutions
	CO5	Explain firewall, its types, intrusion detection mechanisms and web security

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Course Title: MOBILE NETWORK ARCHITECTURE		
SubjectCode:24PCN14	Credit:3	CIE: 50
Number of Lecture Hours/Week	2:0:2 Hrs	SEE:50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisites: Computer Networks.		
Course Objectives: Discuss different wireless technologies like GSM,GPRS, UMTS,LTE and WiMAX, its operation and understand commonalities ,differences between them		
MODULES		Teaching Hours
Module I Global System for Mobile Communications (GSM): Circuit-Switched Data Transmission, Standards, Transmission Speeds, The Signalling System Number 7, The GSM Subsystems, The Network Subsystem, The Base Station Subsystem (BSS) and Voice Processing: Frequency Bands, The Base Transceiver Station (BTS), The GSM Air Interface, The Base Station Controller (BSC), Mobility Management and Call Control, The Mobile Device, The SIM Card, The Intelligent Network Subsystem and CAMEL.		09 Hrs
Module II General Packet Radio Service (GPRS) and EDGE: Circuit-Switched Data Transmission over GSM, Packet-Switched Data Transmission over GPRS, The GPRS Air Interface, The GPRS State Model, GPRS Network Elements, GPRS Radio Resource Management, GPRS Interfaces, GPRS Mobility Management and Session Management (GMM/SM), Session Management from a User Point of View, Small Screen Web Browsing over GPRS and EDGE, The Multimedia Messaging Service (MMS) over GPRS, Web Browsing via GPRS.		08 Hrs
Module III Universal Mobile Telecommunications Systems (UMTS) and High-Speed Packet Access (HSPA) : Important New Concepts of UMTS, Code Division Multiple Access (CDMA), UMTS Channel Structure on the Air Interface, The UMTS Terrestrial Radio Access Network (UTRAN), Core Network Mobility Management, Radio Network Mobility Management, UMTS CS and PS Call Establishment, High-Speed Downlink Packet Access (HSDPA) and HSPA+, High-Speed Uplink Packet Access (HSUPA).		08 Hrs
Module IV Long Term Evolution (LTE): Introduction and Overview, Network Architecture and Interfaces, FDD Air Interface and Radio Network, TD-LTE Air Interface, Scheduling, Basic Procedures, Mobility Management and Power Optimization, LTE Security Architecture, Interconnection with UMTS and GSM		08 Hrs

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Module V		09 Hrs
IEEE 802.16 and WiMAX: Overview, Standards, Evolution and Profiles, WiMAX PHYs for Point-to-Multipoint FDD or TDD Operation, Physical Layer Framing, Ensuring Quality of Service, MAC Management Functions, MAC Management of User Data, Security, Advanced 802.16 Functionalities, Mobile WiMAX: 802.16e.		
Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.		
TEXTBOOKS: 1. Martin Sauter: From GSM to LTE, An Introduction to Mobile Networks and Mobile Broadband, 1st Edition, Willey 2011.		
REFERENCEBOOKS: 1. Andre Perez: Mobile Network Architecture, 1st Edition, Wiley 2012. 2. Iti Saha Misra: Wireless Communications Networks, 3G and Beyond, 2nd Edition, Tata McGraw Hill, 2009. 3. Ajay R. Mishra: Cellular Technologies for Emerging Markets, 2G, 3G and Beyond, Willey 2010		
Course outcomes: On completion of the course, the student will have the ability to:		
Course Code	CO#	Course Outcome(CO)
24PCN14	CO1	Describe the structure of GSM network and its constituent elements.
	CO2	Compare and contrast GSM with GPRS and discuss GPRS EDGE enhancements.
	CO3	Explain UMTS systems its enhancements and analyze its characteristics.
	CO4	Illustrate LTE architecture and security
	CO5	Discuss IEEE 802.16 and WIMAX Standard

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Course Title: ADVANCED COMPUTER NETWORKS		
SubjectCode:24PCN15	Credit:4	CIE: 50
Number of Lecture Hours/Week	2:0:2 Hrs	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
Prerequisites: Computer Networks.		
Course Objectives: <ul style="list-style-type: none"> • Review the underlying concepts of data communication and computer network • Gain knowledge about functions of data link layer and related protocols and describeworking of simple LAN with hubs, bridges and switches • Learn Internetworking with emphasis on routing protocols, architectures and implementationissues • Learn functions of transport layer, study congestion control mechanisms and build networkapplications using TCP/IP model. 		
MODULES		Teaching Hours
<p style="text-align: center;">Module I</p> <p>Review of Basic Concepts& Direct Link Networks: Building a Network; Requirements- Connectivity, Cost-Effective Resource Sharing support for Common Services; Network Architecture-Layering and Protocols, OSI Architecture, Internet Architecture; Performance-Band width and Latency, Delay × Bandwidth Product, High-Speed Networks. Hardware Building Blocks-nodes, links; Encoding (NRZ, NRZI, Manchester, 4B / 5B), Framing, Error Detection -Two-Dimensional Parity, Internet checksum Algorithm, cyclic Redundancy Check; reliable Transmission Stop-and-Wait, Sliding Window, Concurrent Logical Channels; Ethernet (802.3), Rings(802.5,FDDI)–Token Ring Media Access Control, Token Ring Maintenance, FDDI.</p> <p>Implement the following using C/C++/Java or equivalent with LINUX/ Windows environment.</p> <ul style="list-style-type: none"> • Implement internet checksum and CRC algorithm • Implement sliding window Protocol 		11 Hrs
<p style="text-align: center;">Module II</p> <p>Packet Switching: Switching and forwarding – Datagrams, Virtual Circuit Switching, Source Routing; Bridges and LAN Switches–Learning Bridges, Spanning Tree Algorithm, Broadcast and Multicast, Limitations of Bridges; cell switching (ATM) – Cells, Segmentation and Reassembly, Virtual Paths, Physical Layers for ATM. Simple internetworking (IP)-What is an Internet work? Service Model, Global Address, Datagram Forwarding in IP.</p> <ul style="list-style-type: none"> • Demonstrate IP datagram forwarding algorithm. • Implement Spanning tree algorithm 		10 Hrs

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Module III		
<p>Internetworking: Address Translation(ARP), Host configuration(DHCP),Error Reporting (ICMP), Virtual Networks and Tunnels, Network as a Graph, distance Vector (RIP), Link State (OSPF), Metrics, Routing for Mobile Hosts, Global Internet–Subnetting, Classless Routing(CIDR), Interdomain Routing (BGP), Routing Areas, IP Version 6(IPv6); Multiprotocol Label Switching (MPLS).</p> <ul style="list-style-type: none"> • Configuring RIP • Configuring a Cisco Router as a DHCP server 		10 Hrs
Module IV		
<p>End-to-End Protocols & Resource Allocation: Simple demultiplexer (UDP); Reliable byte stream (TCP)–End-to-End Issues, Segment Format, Connection Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, record Boundaries, TCP Extensions, Alternative Design Choices, Issues in resource allocation–Network Model, Taxonomy, Evaluation Criteria; Queuing disciplines.</p> <ul style="list-style-type: none"> • Implement queuing Disciplines 		10 Hrs
Module V		
<p>Congestion Control & Application: TCP Congestion Control–Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery; Congestion-Avoidance mechanisms–DEC bit, Random Early Detection (RED), Source-Based Congestion Control. Traditional applications–Electronic Mail (SMTP, MIME, IMAP),World Wide Web(HTTP), Name Service(DNS), Network management(SNMP); Web services–Custom APPLICATION Protocols (WSDL, SOAP),A Generic application Protocol (REST).</p> <ul style="list-style-type: none"> • Configure SMTP ,DNS using Cisco packet tracer 		11 Hrs
<p>Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.</p>		
<p>TEXTBOOKS: 1. Larry L. Peterson and Bruce S. Davie: Computer Networks–A Systems Approach, 4th Edition,Elsevier,2007.</p>		
<p>REFERENCEBOOKS: 1. Behrouz A. Forouzan: Data CommunicationsandNetworking,4th Edition, Tata McGrawHill,2006. 2. William Stallings: Data and ComputerCommunication,8th Edition, Pearson Education,2007. 3. Alberto Leon- Garcia and Indra Widjaja: Communication Networks-Fundamental Conceptsand KeyArchitectures,2nd Edition TataMcGraw-Hill,2004.</p>		
<p>Course outcomes: On completion of the course, the student will have the ability to:</p>		
Course Code	CO#	Course Outcome(CO)
	CO1	Explain architectural concepts of layering, error on troll techniques and

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24PCN15		analyze data link protocols their analysis
	CO2	Describe the working of LAN, bridges and switches
	CO3	Describe principles of internetworking and illustrate internet routing protocols
	CO4	Explain working of transport layer protocols and resource allocation
	CO5	Explain TCP congestion control techniques and application layer protocols

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Course Title: MOBILE APPLICATION DEVELOPMENT LABORATORY		
Subject Code : 24PCNL16	Credit :02	CIE: 50
Number of Lecture Hours/Week	1:2:0 Hrs	SEE: 50
		SEE Hours: 03
Prerequisites: Programming language – C++, Java		
Course Objectives:		
<ul style="list-style-type: none">• Write simple GUI applications, use built-in widgets and components, work with the database to store data locally• Design, develop, and deploy mobile apps on Android devices		
PROGRAMS		
<ol style="list-style-type: none">1. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.2. Create an application that takes the text from the text box and shows using Toast.3. Create an Android application to implement simple arithmetic calculator. Use Buttons for each arithmetic operation.4. Create a screen with linear layout that has input boxes for User Name, Password, Address, Gender (radio buttons), Age (numeric), State (Spinner) and a Submit button. On clicking the submit button, print all the data as Toast.5. Create an application to show details of students on selecting a name from student list with help native database – SQLite.6. Create a user registration application that stores the user details in a database table using native database-SQLite.7. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.8. Develop an application for handling notifications.9. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.10. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.		

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Note: Every exercise should be demonstrated on android handset.

Question paper pattern: For SEE , two programs from the Exercise programs list will be asked.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
24PCNL16	CO1	Demonstrate understanding of android application development concepts
	CO2	Exhibit expertise and proficiency in using android services and mechanisms for developing android applications.
	CO3	Exhibit the skills of writing programs related to Android programming in order to generate and deploy the application on android handsets following the ethical standards.
	CO4	Demonstrate the skill of oral communication to present his /her views on Android programming concepts.
	CO5	Prepare report covering details about various APIs used in the experiments.

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Course Title: CRYPTOGRAPHY AND NETWORK SECURITY LAB		
Subject Code : 24PCNL17	Credit : 2	CIE: 50
Number of Practical Hours/Week/batch	3 Hrs	SEE: 50
		SEE Hours: 03
Pre-requisite: Data Communication, C, C++, Java		
Course Objectives:		
<ul style="list-style-type: none">• Implement application layer and data link layer protocols.• Configure LAN and wireless network and conduct performance evaluation using networksimulator tools.		
List of Programs		
PART A		
Implement the following using C/C++/Java or equivalent with LINUX/Windows environment:		
<ol style="list-style-type: none">1. Write a program to implement Ceaser Cipher and Hill Cipher.2. Perform Cryptanalysis using frequency /statistical analysis (using anyopen source tools).3. Write a program to implement RSA Algorithm (using JAVACryptography API).4. Setup a honeypot and monitor the honeypot on a network.5. Installation of rootkit and study about the internal processes running.6. Use NMAP software for port monitoring.7. Demonstrate how to sniff for router traffic by using the toolWIRESHARK.8. Demonstrate intrusion detection system (ids) using any tool (snort s/w).		
PART B		
Simulation Programs using Qualnet 7.1 / NS2 or any other equivalentsoftware.		
Note: (i) Analyze the network behavior by collecting the statistics onnetwork performance and draw the conclusion.		
(ii) Standard Network Parameters and supporting protocols may beassumed for simulation.		
<ol style="list-style-type: none">1. Create a scenario for homogeneous WLAN (IBSS / BSS network) usingBellman ford routing protocol and analyze the network behavior for the following cases.<ol style="list-style-type: none">a. Network hub and without mobilityb. Network hub and with mobility.c. Using 0.5 sq km terrain.2. Design architecture for Universal Mobile Telecommunications System (UMTS) and analyze the network behavior.3. Create a scenario for homogeneous WLAN (BSS Network/Infrastructure mode) using 0.5 sq.km terrain using AODV routing protocol and analyze the network behavior.4. Create a scenario for homogeneous WLAN (Mobile Ad hoc Network)using 2 sq.km		

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terrain and analyze the network behavior.

- a. Without mobility
- b. With mobility

5. Create a scenario for homogeneous/ heterogeneous Mobile Ad hoc Network onto a terrain file using AODV routing protocol and apply the geographical parameters such as Cartesian latitude and longitude and analyze the network behavior.
6. Create a scenario for Heterogeneous Network analysis behavior and analyze the network behavior.
 - a. Using Bellman ford routing protocol without mobility.
 - b. Using Bellman ford routing protocol with mobility.

Using AODV routing protocol and apply weather (rain fall) properties to it.
7. Analyse different encoding (Base 64, URL, HTML) and encryption (MD5, SHA1, SHA2 etc) Mechanism used in application.
8. Program to identify open pores in the IP Address

Question paper pattern:

For SEE student is required to execute one pro gram from Part A and one program from PartB . SEE marks will be evaluated as Part A : 35 Marks and Part B: 15 Marks

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
24PCNL17	CO1	Design and develop encryption and decryption algorithms for network security.
	CO2	Demonstrate use of open source security tools to exhibit expertise and proficiency in using network security tools for developing secure applications.
	CO3	Develop skills of writing programs related to simulation of wireless networks following ethical standards.
	CO4	Design and conduct performance study of wireless network routing protocols under various scenarios.
	CO5	Demonstrate the skill of oral communication to present his /her views on network security and wireless networks and prepare report covering details about various APIs used in the experiments.

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Course Title: RESEARCH METHODOLOGY AND IPR (ONLINE)		
Subject Code: 24RMI19	Credits:3	CIE:50
Number of Lecture Hours/Week	3 Hrs (Th)	SEE:50
Total Number of Lecture Hours	42	SEE Hours: 03
Prerequisite: Working on Discrete mathematics, Programming ability and exposure to probability.		
Course Objectives:		
MODULES		Teaching Hours
Module I		08 Hrs
Research Methodology: Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India. Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration.		
Module II		
Reviewing the literature: Place of the literature review in research, bringing clarity and focus to research problem, improving research methodology, broadening knowledge base in research area, Enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed. Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.		09 Hrs
Module III		09 Hrs
Design of Sample Surveys: Design of Sampling: Introduction, Sample Design, Sampling and Non-Sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs. Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement, Techniques of Developing Measurement Tools, Scaling, Scale Classification Bases, Scaling Technics, Multi dimensional Scaling, Deciding the Scale. Data Collection: Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection,		

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Module IV	09 Hrs
<p>Testing of Hypotheses: Hypothesis, Basic Concepts Concerning Testing of Hypotheses, Testing of Hypothesis, Test Statistics and Critical Region, Critical Value and Decision Rule, Procedure for Hypothesis Testing, Hypothesis Testing for Mean, Proportion, Variance, for Difference of Two Mean, for Difference of Two Proportions, for Difference of Two Variances, P-Value approach, Power of Test, Limitations of the Tests of Hypothesis. Chi-square Test: Test of Difference of more than Two Proportions, Test of Independence of Attributes, Test of Goodness of Fit, Cautions in Using Chi-square Tests, Ztest, Ttest, Ftest, ANOVA, Factor Analysis and Report Writing; Bibliography. Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. Analysis of variance and covariance.</p>	
Module V	07 Hrs
<p>Intellectual Property: The Concept, Intellectual Property System in India, World Intellectual Property Organization (WIPO), Protection of Intellectual Property under TRIPS, Patents Act - Meaning of a Patent – Characteristics/Features. Patentable and Non-Patentable Invention. Types of Patent applications in India. Procedure for obtaining Patent. The Designs Act- Introduction to Industrial Designs. Essential requirements of Registration. Designs which are not registrable, Procedure for Registration of Designs, Copyright Act, 1957 and Related Rights - Meaning of Copy Right, Characteristics of Copyright, various rights of owner of Copyright. Procedure for registration, Publication and term of copyright Infringement of Copyright and Its remedies. Trade Mark Act, 1999, The Geographical Indications of Goods (Registration and Protection) Act 1999.</p>	
<p>Question paper pattern: The question paper will have ten questions. There will be 2 questions from each module, covering all the topics from a module. The students will have to answer 5 full questions, selecting one full question from each module.</p>	
<p>TEXT BOOKS.</p> <ol style="list-style-type: none"> 1. Research Methodology: Methods and Techniques C.R.Kothari, Gaurav Garg New Age International 4th Edition, 2018. 2. Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under module 2) Ranjit Kumar SAGE Publications Ltd 3rd Edition, 2011. 3. Study Material (For the topic Intellectual Property under module 5) Professional Programmed Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013. 	

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REFERENCEBOOKS:

1. Research Methods: The concise knowledge base Trochim Atomic Dog Publishing 2005.

Course Code	CO#	Course Outcome (CO)
24RMI19	CO1	Discuss research methodology and the technique of defining are search problem
	CO2	Explain the functions of the literature review in research, carrying out a literature search, developing theoretical and conceptual frame works and writing are view.
	CO3	Explain various research designs and their characteristics.
	CO4	Explain the art of interpretation and the art of writing research reports