DEPARTMENT OF INFORMATION TECHNOLOGY

NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR

7th Semester

Course	Code	L	T	P	Credits
Wireless & Mobile Communication	**ITT401**	**3**	**1**	**0**	**4**

Course Outcomes (COs):

CO1: Understand the need for wireless communication
CO2: Study cellular concepts design capacity and different methods to eliminate interference.
CO3: Study various access techniques like FDMA, TDMA, etc and wireless networks and wireless protocols like WAP
CO4: Understanding wireless standards like GSM, CDMA etc.
CO5: Understanding various security issues and methods to increase security in wireless systems

Syllabus:

UNIT I - INTRODUCTION TO WIRELESS NETWORKS:

Introduction-Evolution of mobile radio communications-Differences Between Wireless And Fixed Telephone Networks-Development Of Wireless Networks- Traffic Routing In Wireless Networks- Integrated Services Digital Network (ISDN)- Protocols For Network Access

UNIT II - PRINCIPLES OF CELLULAR WIRELESS NETWORKS:

Introduction- Frequency Reuse- Channel Assignment Strategies-Handoff Strategies-Interference And System Capacity- Trunking And Grade Of Service-Improving Capacity In Cellular Systems.

UNIT III - MULTIPLE ACCESS TECHNIQUES:

Introduction-Multiple Access Techniques: FDMA,TDMA, CDMA- Space Division Multiple Access- Spread Spectrum - Packet Radio

UNIT IV - WIRELESS SYSTEMS AND STANDARDS:

Global System for Mobile communication - CDMA Digital Cellular Standard (IS-95) - CT2 Standard for Cordless Telephones- Digital European Cordless Telephones (DECT). Mobile communication: Mobile data management in 1G,2G,3G, Frequency reuse, sectoring, GSM and CDMA architecture, EDGE technology, Mobile IP, Mobile Agents.

UNIT V - MOBILE AND WIRELESS SECURITY:

Creating Secure Environment- Security Threats-WAP Security: TLS-WTLS-IPSec- Application Level Security- Smart Client: Architecture, Security-Firewalls- VPNs-Two factor Authentication. Mobile Communication & application development.

Text Books:

1. Theodore.S.Rappaport, *Wireless Communications-Principles and practice*, Prentice Hall Communications Engineering and Emerging Technologies Series, Upper Saddle River, New Jersey
2. Martyn Mallick, *Mobile and Wireless Design Essentials*, Wiley Dreamtech India pvt ltd.
3. Geoff Varall, Roger Belcher,*3G Handset & Network Design*, Wiley Dreamtech India pvt ltd.

References:

1. Jochen Schiller, *Mobile Communications*, Addision Wesley
2. William C.Y.Lee, *Mobile Communication Design Fundamentals*, John Wiley

Course	Code	L	T	P	Credits
Information Security	**ITT402**	**3**	**1**	**0**	**4**

Course Outcomes (COs):

CO1: To study the history, need, and various approaches to Information security.
CO2: To understand the use of encryption and decryption
CO3: To study the various technical aspects and strategies of implementation of Symmetric Encryption
CO4: To study the various technical aspects and strategies of implementation of Asymmetric Encryption
CO5: Achieving Authentication using keys

Syllabus:

UNIT I - INTRODUCTION TO INFORMATION SECURITY:

Introduction, the History of Information Security, What Is Security, CNSS Security Model, Components of an Information System, Balancing Information Security and Access, Approaches to Information Security, the Systems Development Life the Security Systems, Development Life Cycle, Security Professionals and the Organization.

UNIT II - THE NEED FOR SECURITY:

Introduction, Business Needs First, Threats, Attacks, And Secure Software Development. Planning for Security: Introduction, Information Security Planning and Governance, Information

Security Governance, Information Security Policy, Standards, and Practices, The Information Security Blueprint ,Security Education, Training, and Awareness Program, Continuity Strategies, Model for a Consolidated Contingency Plan, Law Enforcement Involvement.

UNIT III - IMPLEMENTING AND MAINTENANCE:

Introduction, Information Security Project Management, Developing the Project Plan, Project Planning Considerations, Scope Considerations, the Need for Project Management, Technical Aspects of Implementation, Conversion Strategies,the Bull's-Eye Model, Considerations for Organizational Change, Information Systems Security Certification and Accreditation.

UNIT IV - CRYPTOGRAPHY:

Introduction, Foundations of Cryptology, Cipher Methods, Substitution Cipher, Transposition Cipher, Exclusive OR, Vernam Cipher, Book or Running Key Cipher, Hash Functions, Cryptographic Algorithms, Symmetric Encryption, Asymmetric Encryption, Examples, Encryption Key Size, Cryptographic Tools, Public-Key Infrastructure (PKI), Digital signature ,Digital Certificates, Hybrid Cryptography Systems, Steganography, Attacks on Cryptosystems, Man-in-the-Middle Attack, Correlation Attacks, Dictionary Attacks, Timing Attacks, Defending Against Attacks, Protocols for Secure Communications, S-HTTP and SSL, S/MIME, PEM, and PGP, SET, WEP and WPA,IEEE 802.1x based authentication, IPSec and PGP.

Text Books:

1. Michael E. Whitman, Herbert J. Mattord, "Principles of information security",Course Technology, Cengage Learning.

Reference Books:

1. William Stallings, "Cryptography and Network Security – Principles and Practices".
2. Michael E. Whitman, Herbert J. Mattord, "Hands-On Information Security Lab Manual" Course Technology, Cengage Learning.

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Course	Code	L	T	P	Credits
Image Processing	**ITT403**	**3**	**1**	**0**	**4**

Course Outcomes (COs):

CO1: To understand what a digital image is and the steps involved in image processing.
CO2: To understand image acquisition process and develop any image processing application.
CO3: To learn different techniques employed for the enhancement of image.
CO4: To understand different color image models and learn different causes of image degradation and overview of image restoration.
CO5: To understand the need for image compression and to learn spatial and frequency domain techniques for image compression, segmentation of image and understand morphological image processing

Syllabus:

UNIT I - INTRODUCTION:

What is digital image processing? The origins of digital image processing, Fundamental steps in digital image processing, components of an image processing system.

UNIT II - DIGITAL IMAGE FUNDAMENTALS:

Image sensing and acquisition, Image sampling and quantisation, basic relationships between pixels, linear and non-linear operations.

UNIT III - IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN:

Gray level transformations, histogram processing, enhancement using arithmetic/logic operations, spatial filtering, smoothing and sharpening.

Image enhancement in Frequency Domain: Fourier transform and frequency domain, smoothing and sharpening frequency domain filters

Image Restoration: A Model of the Image Degradation/Restoration Process. Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering. Constrained Least Squares Filtering, Geometric Mean Filter, Geometric Transformations.

UNIT IV - COLOUR IMAGE PROCESSING:

Fundamentals, models, colour transformations, smoothing and sharpening, colour segmentation and noise.

Image Segmentation: Detection of discontinuities, edge linking and boundary detection, thresholding, region based segmentation, morphological watersheds.

Representation and description: Representation, boundary descriptors, regional descriptors, relational descriptors.

UNIT V - IMAGE COMPRESSION:

Morphological Image Processing, Representation and Description.

Text Books:

1. Rafael C Gonzalez, Richard E Woods, Digital Image Processing - Pearson Education
2. Rafael C Gonzalez, Richard E Woods, Digital Image Processing with MATLAB-Pearson Education.

Reference Books:

1. William K Pratt, Digital Image Processing, John Willey
2. A.K. Jain, PHI, Fundamentals of Digital Image Processing, pearson Education.
3. Chanda & Majumdar, “Digital Image Processing and Analysis” , PHI.
4. Mark Nelson, Jean-Loup Gailly “The Data compression Book”, bpb Publications.

Course	Code	L	T	P	Credits
Cloud Computing	**ITT404**	**3**	**1**	**0**	**4**

Course Outcomes (COs):

CO1: Understand various basic concepts related to cloud computing technologies.
Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS
Understand big data analysis tools and techniques.
CO2: Understand the underlying principle of web services, cloud virtualization, cloud storage, data management and data virtualization.
CO3: Understand different Multi-tenant software, Be familiar with cloud file systems.
CO4: Have detailed knowledge on cloud computing security challenges and other issues.
CO5: Be familiar with setting up cloud. Understanding integrating tools.

Syllabus:

UNIT I - INTRODUCTION TO CLOUD COMPUTING:

Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Virtualization concepts; Types of Virtualization & its benefits, Introduction to Various Virtualization OS(Vmware , KVM etc), HA/DR using Virtualization, Moving VMs ,SAN backend concepts,Cloud Fundamentals; Cloud Building Blocks, Understanding Public & Private cloud environments.
Cloud Technologies, Study of Hypervisors.

UNIT II - WEB SERVICES, AJAX AND MASHUPS:
Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services.
Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization.

UNIT III - MULTI TENANT SOFTWARE:
Multi-entity support, Multi-schema approach, Multi-tenance using cloud data stores, Data access control for enterprise applications.Data in the cloud Relational databases,
Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. Map-Reduce and extensions: Parallel computing, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce.

UNIT IV - CLOUD COMPUTING SECURITY CHALLENGES:
Issues in cloud computing, Implementing real time application over cloud platform Issues in Intercloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment .Vulnerability assessment tool for cloud, Privacy and Security in cloud Virtualization security management- virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.

UNIT V - SETTING UP CLOUD:
How to build private cloud using open source tools, Understanding various cloud plugins, Setting up your own cloud environment; Auto provisioning, Custom images, Integrating tools like Nagios ,Integration of Public and Private cloud.

Text Book:
1. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper
2. Enterprise Cloud Computing by Gautam Shroff,Cambridge
3. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

Reference Book:
1. Google Apps by Scott Granneman,Pearson
2. Cloud Security & Privacy by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O'REILLY)
3. Cloud Computing : A Practical Approach, Antohy T Velte, et.al McGraw Hill,
4. Cloud Computing Bible by Barrie Sosinsky, Wiley India

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Course	Code	L	T	P	Credits
Information Security Lab	**ITL405**	**0**	**0**	**2**	**1**

Course Outcomes (COs):

CO1: To create and understand use of vulnerable machines
CO2: To use traffic analysis, enumeration and fingerprinting tools
CO3: To understand use of password cracking tools
CO4: To deploy tools to protect a system

Syllabus:

1. Deploying virtual machines testbed over virtualization software such as: VMPlayer or VirtualBox
2. Creating test machines including Kali/Backtrack and vulnerable machine.
3. Configure and demonstrate use of Traffic monitoringtool such as: Wireshark and tcpdump
4. Configure and demonstrate use of basic Enumeration tools such as: Ping,traceroute, nslookup,dig, nmap
5. Configure and demonstrate use of fingerprinting tools such as:

Nmap(Zenmap) ,hping3,DMitry.

6. Configure and demonstrate use of vulnerability assessment tool such as: Nessus, openVAS.
7. Configure and demonstrate use exploit tool such as: metasploit framework.
8. Demonstrate use of a password cracking tool using brute force attack, dictionary attack rainbow tables.
9. Configure and demonstrate use of computer forensics tool.
10. Configuring and deploying Firewall.
11. Configure and demonstrate use of IDS tool such as snort.
12. Configuring and deploying IDPS.

Course	Code	L	T	P	Credits
Image Processing Lab	**ITL406**	**0**	**0**	**2**	**1**

Course Outcomes (COs):

CO1: Display image, its histogram, zoom and shrink image
CO2: Perform enhancing operations on the image using spatial filters and frequency domain filters. Remove noise from image
CO3: Use transforms and analyze the characteristics of the image.
CO4: Perform segmentation operations in the images.

Syllabus:

1. Display an image and its histogram.
2. Perform shrinking, zooming and cropping of an image.
3. Perform the experiment for histogram equalization.
4. Perform blurring and de-blurring on an image.
5. Implement the spatial image enhancement functions on a bitmap image – Mirroring (Inversion).

6. Implement the spatial image enhancement functions on a bitmap image – Rotation (Clockwise).
7. Implement the spatial image enhancement functions on a bitmap image – Enlargement (Double Size).
8. Implement (a) Low Pass Filter (b) High Pass Filter.
9. Implement (a) Arithmetic Mean Filter (b) Geometric Mean Filter.
10. Removal of salt and pepper noise.
11. Implement Smoothing and Sharpening of an eight bit color image.
12. Implement (a) Boundary Extraction Algorithm (b) Graham's Scan Algorithm.
13. Implement (a) Edge Detection (b) Line Detection.

Course	Code	L	T	P	Credits
Cloud Computing Lab	**ITL407**	**0**	**0**	**2**	**1**

Course Outcomes (COs):

CO1: Student should understand and appreciate cloud architecture.
CO2: Student can create and run virtual machines on open source OS
CO3: Student can implement Infrastructure, storage as a Service.
CO4: Student can install and configure Hadoop and Map/Reduce.
CO5: Students can install and appreciate security features and user management for cloud using web application.

Syllabus:

1. Introduction to cloud computing.
2. Implementation of SOAP Web services in C#/JAVA Applications.
3. Implementation of para-virtualization using VM Ware's Workstation/Oracle's Virtual Box and Guest O.S.
4. Implementation of IAAS, SAAS.
5. Installation and Configuration of Hadoop.

6. Create an application (Ex: Word Count) using Hadoop Map/Reduce.
7. Case Study: PAAS (Facebook, Google App Engine)
8. Case Study: Amazon Web Services

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8th Semester

Course	Code	L	T	P	Credits
Machine Learning	**ITT450**	**3**	**1**	**0**	**4**

Course Outcomes (COs):

CO1: Develop an appreciation for what is involved in learning models from data.
CO2: Understand a wide variety of learning algorithms.
CO3: Understand how to evaluate models generated from data.
CO4: Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

Syllabus:

UNIT I - INTRODUCTION:

Machine Learning, Supervised Learning, Unsupervised Learning, Reinforcement Learning. Introduction to Probability, Basics Linear Algebra, Statistical Decision Theory – Regression & Classification, Bias – Variance, Overfitting and complexity; training, validation, test data.

UNIT II - SUPERVISED LEARNING

Regression:-Linear Regression-Cost Function, Gradient Descent with single and multivariable,

Normal Equation, Regularization Techniques (LASSO), Polynomial Regression
Classification:- Logistic Regression-Hypothesis Representation, Decision boundary, Cost Function, Multi class Classification, KNN, Ensemble methods, Decision Trees, Naïve Bayes,

UNIT III- ARTIFICIAL NEURAL NETWORKS AND SVMs

Neurons and biological motivation. Linear threshold units. Perceptrons: representational limitation and gradient descent training. Multilayer networks and backpropagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks, SVMs:-(Maximum margin linear separators), optimization objectives,. Kernels for learning non-linear functions.

UNIT IV - UNSUPERVISED LEARNING

Clustering:-K-Means, K Nearest Neighbours, Association Rule Learning
Dimensionality Reduction, PCA, SVD, tSNE
Markov Models

UNIT V - MACHINE LEARNING APPLICATIONS

Healthcare, Retail, Financial Services, Manufacturing, Hospitality, Cloud Based ML Offerings
Developing and Evaluating an Anomaly Detection System, Recommender Systems.

Text Books:

1. Machine Learning by Tom Mitchell (ML)
2. Introduction to Machine Learning by Ethem Alpaydin (IML)
Elements of Statistical Learning by Trevor Hastie, Robert Tibshirani and Jerome Friedman (available online for free) (ESL)
3.Pattern Recognition and Machine Learning by Christopher Bishop (PRML)