ACE

Engineering College

An Autonomous Institution

All the courses are Accredited by NBA and NAAC with A Grade,Affiliated to JNTUH

Ankushapur ,Ghatkesar ,Medchal,Hyderabad-501301

B.TECH. FOUR YEAR DEGREE COURSE

DEPARTMENT OF INFORMATION TECHNOLOGY

IV YEAR I SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	IT701PC	Information Security	3	0	0	3
2	IT702PC	Cloud Computing	3	0	0	3
3	IT745PE	Ad-hoc & Sensor Networks Professional Elective -IV	3	0	0	3
4	IT754PE	Deep Learning Professional Elective -V	3	0	0	3
5	EC700OE	Electronic Sensors Open Elective-II	3	0	0	3
6	IT703PC	Information Security Lab	0	0	2	1
7	IT704PC	Cloud Computing Lab	0	0	2	1
8	IT705PC	Project Stage - I	0	0	6	3
		Total	**15**	**0**	**10**	**20**

Professional Elective - IV

IT741PE	Human Computer Interaction
IT742PE	High Performance Computing
IT743PE	Artificial Intelligence
IT744PE	Information Retrieval Systems
IT745PE	Ad-hoc & Sensor Networks

Professional Elective - V

IT751PE	Intrusion Detection Systems
IT752PE	Real Time Systems
IT753PE	Blockchain Technology
IT754PE	Deep Learning
IT755PE	Software Process & Project Management

Open Elective -2:

1. IT721OE: Full Stack development
2. IT722OE: Scripting Languages

IT701PC: INFORMATION SECURITY

B.Tech. IV Year I Sem. **L T P C**
0 0 2 1

Prerequisites

1. A Course on "Computer Networks and a course on Mathematics.

Course Objectives

- To understand the fundamentals of Cryptography.
- To understand various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across datanetworks.
- To apply algorithms used for secure transactions in real world applications.

Course Outcomes

- Demonstrate the knowledge of cryptography, network security concepts and applications.
- Ability to apply security principles in system design.
- Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them.
- Proficiency in Implementing Public Key Cryptography for Organizational Applications
- Mastery of Digital Signature Technology for Real-world Deployment.
- Comprehensive Understanding of Viruses and Intrusion Techniques for Future-proofing.

UNIT - I

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security

Classical Encryption Techniques: DES, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operation, Blowfish, Placement of Encryption Function, Traffic Confidentiality, key Distribution, Random Number Generation.

UNIT - II

Public key Cryptography Principles, RSA algorithm, Key Management, Diffie-Hellman Key Exchange,Elliptic Curve Cryptography.

Message authentication and Hash Functions: Authentication Requirements and Functions, Message Authentication, Hash Functions and MACs Hash and MAC Algorithms SHA-512, HMAC.

UNIT - III

Digital Signatures: Authentication Protocols, Digital signature Standard, Authentication Applications, Kerberos, X.509 Directory Authentication Service.
Email Security: Pretty Good Privacy (PGP) and S/MIME.

UNIT - IV

IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Web Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security(TLS), Secure Electronic Transaction (SET).

UNIT - V

Intruders, Viruses and Worms Intruders, Viruses and related threats.

Firewalls: Firewall Design Principles, Trusted Systems, Intrusion Detection Systems.

TEXT BOOK:

1. Cryptography and Network Security (principles and approaches) by William Stallings Pearson Education, 4th Edition.

REFERENCE BOOKS:

1. Network Security Essentials (Applications and Standards) by William Stallings PearsonEducation.
2. Principles of Information Security, Whitman, Thomson.

IT702PC: CLOUD COMPUTING

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Pre-requisites:

1. A course on "Computer Networks".
2. A course on "Operating System".

Course Objectives:

- This course provides an insight into cloud computing
- Topics covered include- Cloud Computing Architecture, Deployment Models, Service Models, Technological Drivers for Cloud Computing, Networking for Cloud Computing and Security in Cloud Computing

Course Outcomes:

- Understand different computing paradigms and potential of the paradigms and specificallycloud computing
- Understand cloud service types, cloud deployment models and technologies supporting anddriving the cloud
- Acquire the knowledge of programming models for cloud and development of softwareapplication that runs the cloud and various services available from major cloud providers
- Understand the security concerns and issues in cloud computing
- Acquire the knowledge of advances in cloud computing.
- Achieve the knowledge on various Cloud Service Providers.

UNIT - I

Computing Paradigms, Cloud Computing Fundamentals, Cloud Computing Architecture and Management

UNIT - II

Cloud Deployment Models, Cloud Service Models, Technological Drivers for Cloud Computing**:** SOA and Cloud, Multicore Technology, Web 2.0 and Web 3.0, Pervasive Computing, Operating System, Application Environment

UNIT - III

Virtualization, Programming Models for Cloud Computing: MapReduce, Cloud Haskell, SoftwareDevelopment in Cloud

UNIT - IV

Networking for Cloud Computing: Introduction, Overview of Data Center Environment, Networking Issues in Data Centers, Transport Layer Issues in DCNs, Cloud Service Providers

UNIT - V

Security in Cloud Computing, and Advanced Concepts in Cloud Computing

TEXT BOOK:

1. Chandrasekaran, K. *Essentials of cloud computing*. CRC Press, 2014

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg,Andrzej M. Goscinski, Wiley, 2011
2. Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff,Cambridge University Press, 2010
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.

IT745PE: AD HOC & SENSOR NETWORKS (Professional Elective – IV)

B.Tech. IV Year I Sem.

L	T	P	C
3	0	0	3

Prerequisites:

- Computer Networks.
- Distributed Systems.
- Mobile Computing.

Course Objectives:

- To understand the challenges of routing in ad-hoc and sensor networks.
- To understand various broadcast, mutlicast and geocasting protocols in ad hoc and sensornetworks.
- To understand basics of Wireless sensors, and Lower Layer Issues and Upper Layer Issues of WSN.

Course Outcomes:

- Understand the concepts of sensor networks and applications.
- Understand and compare the MAC and routing protocols for adhoc networks.
- Understand the transport protocols of sensor networks.
- Understand the Effective Data Transmission Strategies.
- Understand the Multicasting and Geocasting Competency.
- Foundational Knowledge of Wireless Sensor Networks.

UNIT - I

Introduction to Ad Hoc Networks

Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs

Criteria for classification, Taxonomy of MANET routing algorithms, *Topology-based* routing algorithms- Proactive: DSDV, WRP; Reactive: DSR, AODV, TORA; Hybrid: ZRP; *Position-based* routing algorithms- Location Services-DREAM, Quorum-based, GLS; Forwarding Strategies, Greedy Packet, Restricted Directional Flooding-DREAM, LAR; Other routing algorithms-QoS Routing, CEDAR.

UNIT - II

Data Transmission

Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area- based Methods, Neighbour Knowledge-based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

UNIT - III

Geocasting

Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR**.**

TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc.

UNIT - IV

Basics of Wireless Sensors and Lower Layer Issues-Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V

Upper Layer Issues of WSN

Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

TEXT BOOKS

1. Ad Hoc and Sensor Networks – Theory and Applications, *Carlos Corderio Dharma P.Aggarwal,* World Scientific Publications, March 2006, ISBN – 981-256-681-3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

REFERENCE BOOKS:

1. C. Siva Ram Murthy, B.S. Manoj Ad Hoc Wireless Networks: Architectures and Protocols.
2. Taieb Znati Kazem Sohraby, Daniel Minoli, Wireless Sensor Networks: Technology, Protocols andApplications, Wiley.

IT754PE: DEEP LEARNING (Professional Elective –V)

B.Tech. IV Year I Sem. **L T P C**
3 0 0 3

Course Objectives:

- To understand deep Learning algorithms and their applications in real-world data

Course Outcomes:

- Understand machine learning basics and neural networks.
- Understand optimal usage of data for training deep models.
- Apply CNN and RNN models for real-world data.
- Evaluate deep models.
- Develop deep models for real-world problems.
- Analyze and optimize deep learning models for practical use

UNIT -I

Machine Learning Basics

Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

Deep Feedforward Networks Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

UNIT -II

Regularization for Deep Learning

Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under- Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi- Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier, Optimization for Training Deep Models, Learning vs Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.

UNIT-III

Convolutional Networks

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features.

UNIT -IV

Recurrent and Recursive Nets

Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short- Term Memory and Other Gated RNNs, Optimization for Long- Term Dependencies, Explicit Memory.

UNIT -V

Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data**,** Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition.

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural LanguageProcessing, Other Applications.

TEXT BOOK:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.

REFERENCE BOOKS:

1. The Elements of Statistical Learning. Hastie, R. Tibshirani, and J. Friedman, Springer.
2. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.
3. Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.
4. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
5. Golub, G., H., and Van Loan, C.,F., Matrix Computations, JHU Press, 2013.
6. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

EC700OE: ELECTRONIC SENSORS (Open Elective - II)

B.Tech. ECE IV Year I Semester

L	T	P	C
3	0	0	3

Course Objectives:

- Learn the characterization of sensors.
- Known the working of Electromechanical, Thermal, Magnetic and radiation sensors
- Understand the concepts of Electro analytic and smart sensors
- Able to use sensors in different applications

Course Outcomes: Upon completing this course, the student will be able to

- Learn about sensor Principle, Classification and Characterization.
- Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analyticsensors
- Understand the basic concepts of Smart Sensors
- Design a system with sensors

UNIT - I

Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization

Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators,Ultrasonic Sensors

UNIT - II

Thermal Sensors: Introduction ,Gas thermometric Sensors ,Thermal Expansion Type Thermometric Sensors ,Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors ,Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

UNIT- III

Magnetic sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

UNIT - IV

Radiation Sensors: Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, X- ray and Nuclear Radiation Sensors, Fibre Optic Sensors

Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT - V

Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation **Sensors –Applications:** Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing –Sensors for environmentalMonitoring

TEXT BOOKS:

1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravind raghu, CRC press, 2011

REFERENCE BOOKS:

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media,2014.
3. Sensors handbook- Sabrie soloman, 2nd Ed. TMH, 2009

IT703PC: INFORMATION SECURITY LAB

B.Tech. IV Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- To understand the fundamentals of Cryptography.
- To understand various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across datanetworks.
- To apply algorithms used for secure transactions in real world applications.

Course Outcomes:

- Demonstrate the knowledge of cryptography, network security concepts and applications.
- Ability to apply security principles in system design.
- Ability to identify and investigate vulnerabilities and security threats and mechanisms to counter them.

List of Experiments:

1. Implementation of symmetric cipher algorithm (AES and RC4)
2. Random number generation using a subset of digits and alphabets.
3. Implementation of RSA based signature system
4. Implementation of Subset sum
5. Authenticating the given signature using the MD5 hash algorithm.
6. Implementation of Diffie-Hellman algorithm
7. Implementation of the ELGAMAL cryptosystem.
8. Implementation of Goldwasser-Micali probabilistic public key system
9. Implementation of Rabin Cryptosystem. (Optional).
10. Implementation of Kerberos cryptosystem
11. Implementation of a trusted secure web transaction.
12. Digital Certificates and Hybrid (ASSY/SY) encryption, PKI.
13. Message Authentication Codes.
14. Elliptic Curve cryptosystems (Optional)

TEXT BOOK:

1. Cryptography and Network Security (principles and approaches) by William Stallings PearsonEducation, 4th Edition.

REFERENCE BOOKS:

1. Network Security Essentials (Applications and Standards) by William Stallings PearsonEducation.
2. Principles of Information Security, Whitman, Thomson.

IT704PC: CLOUD COMPUTING LAB

B.Tech. IV Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- This course provides an insight into cloud computing
- Topics covered include- distributed system models, different cloud service models, serviceoriented architectures, cloud programming and software environments, resource management.

Course Outcomes:

- Understand various service types, delivery models and technologies of a cloud computingenvironment.
- Understand the ways in which the cloud can be programmed and deployed.
- Understand cloud service providers like Cloudsim, Globus Toolkit etc.
- Examine various programming paradigms suitable to solve real world and scientific problemsusing cloud services.

List of Experiments:

1. Install Virtualbox/VMware Workstation with different flavors of Linux or windows OS on top ofwindows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute SimplePrograms.
3. Create an Amazon EC2 instance and set up a web-server on the instance and associate an IPaddress with the instance.
4. Install Google App Engine. Create a hello world app and other simple web applications usingpython/java.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not presentin CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version).
8. Install Hadoop single node cluster and run simple applications like word count.
9. Create a database instance in the cloud using Amazon RDS.
10. Create a database instance in the cloud using Google Cloud SQL

TEXT BOOK:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014.

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej.
   M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J.
   Dongarra, Elsevier, 2012.
3. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.