

**Dr.A.P.J.Abdul  
kalam Technical University,UttarPardesh,Lucknow**  
(Formerly Uttar Pradesh Technical University)  
**STUDY EVALUATION SCHEME**  
**INFORMATION TECHNOLOGY**  
**YEAR forth, SEMESTER –VII**  
(Effective from the session: 2016-17)

S.No.	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		<u>Open Elective I</u>	3-1-0	30	20	50	100	150	4
2	NIT-701	Cryptography & Network Security	3-1-0	30	20	50	100	150	4
3	NCS-702	Artificial Intelligence	3-1-0	30	20	50	100	150	4
4		<u>Departmental Elective III</u>	3-1-0	30	20	50	100	150	4
5		<u>Departmental Elective IV</u>	3-1-0	30	20	50	100	150	4
<b><u>Practical / Training /Projects</u></b>									
6	NIT-751	Cryptography & Network Security*	0-0-2	-	20	20	30	50	1
7	NCS-752	Project	0-0-6	-	100	100	-	100	3
8	NCS-753	Industrial Training	0-0-2	-	50	50	-	50	1
9	GP-701	General Proficiency	-	-	-	-	-	50	
		Total	15-5-10					1000	25

1. Practical Training done after 6<sup>th</sup> Semester would be evaluated in 7<sup>th</sup> semester through Report and Viva-voce.
2. Project has to be initiated in 7<sup>th</sup> semester beginning and completed by the end of 8<sup>th</sup> semester with proper report and demonstration.

\* At least 10 problems are to be considered based on corresponding theory course.

**Dr.A.P.J.Abdulkalam Technical University,UttarPardesh,Lucknow**  
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**STUDY EVALUATION SCHEME**  
**INFORMATION TECHNOLOGY**  
**YEAR forth, SEMESTER –VIII**  
**(Effective from the session: 2016-17)**

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		<u>Open Elective II</u>	3-1-0	30	20	50	100	150	4
2	NIT-801	Mobile Computing	3-1-0	30	20	50	100	150	4
3		<u>Departmental Elective V</u>	3-1-0	30	20	50	100	150	4
4		<u>Departmental Elective VI</u>	3-1-0	30	20	50	100	150	4
<b>Practicals / Training /Projects</b>									
5	NIT-851	Seminar	0-0-3	-	50	50	-	50	2
6	NCS-852	Project	0-0-12	-	100	100	200	300	7
7	GP-801	General Proficiency	-	-	-	-	-	50	
		<b>Total</b>	<b>12-4-15</b>					<b>1000</b>	<b>25</b>

*\* At least 10 problems are to be considered based on corresponding theory course.*

### **Open Elective I**

NOE-071 Entrepreneurship Development  
NOE-072 Quality Management  
NOE-073 Operations Research  
NOE-074 Introduction to Bio Technology  
NOE-075 Mobile Application Development  
NOE-076 Ethical Hacking and Prevention  
NOE-077 Software Project Management

### **Open Elective II**

1. NOE-081 Non Conventional Energy Resources
2. NOE-082 Non Linear Dynamics Systems
3. NOE-083 Product Development
4. NOE-084 Automation and Robotics

### **Departmental Elective III**

1. NCS-071 Software Testing and Audit
2. NCS-072 Neural Network
3. NIT-071 IT in Forensic Science

### **Departmental Elective IV**

1. NCS-074 High Speed Network
2. NCS-075 Android Operating System
3. NCS-076 Service Oriented Architecture
4. NCS-701 Distributed System
5. NCS-073 Computer Vision

### **Departmental Elective V**

1. NCS-080 Pattern Recognition
2. NCS-082 Real Time System
3. NCS-084 Grid Computing
4. NCS-801 Digital Image Processing
5. NIT-080 Natural Language Processing

### **Departmental Elective VI**

1. NCS-085 Data Compression
2. NCS-087 Embedded Systems
3. NCS-088 Semantic Web and Web Services
4. NIT-081 Software Quality Engineering
5. NIT-082 Software Reliability

## ENTREPRENEURSHIP DEVELOPMENT

NOE-071

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### UNIT -I

**Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries**

**and sub-control types. 5**

**Government policy for small scale industry; stages in starting a small scale industry. 2**

### UNIT -II

**Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. 8**

### UNIT -III

**Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation**

**of financial reports, accounts and stores studies. 9**

### UNIT -IV

**Project Planning and control:**

**The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. 9**

### UNIT -V

**Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes**

**and workman compensation act. 5**

**Role of various national and state agencies which render assistance to small scale industries. 2**

**Text / Reference Books:**

- 1. Forbat, John, "Entrepreneurship" New Age International.**
- 2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International**
- 3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.**

## QUALITY MANAGEMENT

NOE-072

L T P

3 1 0

### UNIT-I

#### Quality Concepts:

Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. 3

#### Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. 2

#### Manufacturing Quality

Methods and techniques for manufacture, inspection and control of product, quality in sales and

services, guarantee, analysis of claims. 5

### UNIT-II

#### Quality Management

Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. 3

#### Human Factor in quality

Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of

apparatus error and corrective methods. 2

### UNIT-III Control

#### Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. 5

#### Attributes of Control Chart

Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. 5

### UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability,

zero defects, quality circle. 8

### UNIT -V

#### ISO-9000 and its concept of Quality Management

7

ISO 9000 series, Taguchi method, JIT in some details.

#### Text / Reference Books:

1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.
2. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

## OPERATIONS RESEARCH

NOE-073

L T P  
3 1 0

### UNIT-I

#### Introduction:

Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study.

#### Linear Programming:

Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.

### UNIT-II

#### Transportation Problems:

Types of transportation problems, mathematical models, transportation algorithms,

#### Assignment:

Allocation and assignment problems and models, processing of job through machines.

### UNIT-III

#### Network Techniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

#### Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

### UNIT-IV

#### Theory of Games :

Rectangular games, Minimax theorem, graphical solution of  $2 \times n$  or  $m \times 2$  games, game with mixed strategies, reduction to linear programming model.

#### Quality Systems:

Elements of Queuing model, generalized poisson queuing model, single server models.

### UNIT-V Inventory

#### Control:

Models of inventory, operation of inventory system, quantity discount.

#### Replacement:

Replacement models: Equipment's that deteriorate with time, equipment's that fail with time.

#### Text / Reference Books:

1. Wayne L. Winston, "Operations Research" Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

## INTRODUCTION TO BIOTECHNOLOGY

NOE-074

L T P

3 1 0

### UNIT-I

**Introduction:** Concept nature and scope of biotechnology.

**Cell Structure and Function:** Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

**Cell Division:** Mitosis and Meiosis. 8

### UNIT-II

**Biomolecules:** A brief account of structure of carbohydrates, Lipids and Proteins.

**Genes:** Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. 7

### UNIT-III

**Gene Expression:** Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

**Genetic Engineering:** Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. 9

### UNIT-IV

**Applications of Biotechnology:** Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. 9

### UNIT-V

**Safety and Ethics:** Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies.

### Text Books/ Reference Books:

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

## MOBILE APPLICATION DEVELOPMENT

NOE-075

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3 1 0

### UNIT I

5

INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

### UNIT II

10

BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

### UNIT III

10

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

### UNIT IV

10

TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

### UNIT V

10

TECHNOLOGY II – iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift: Introduction to Swift, features of swift.

TOTAL LECTURE: 45

### REFERENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Deshpande Composing Mobile Apps,Learn ,explore,apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

## ETHICAL HACKING AND PREVENTION

NOE-076

L T P  
3 1 0

### Unit-I10

Ethical Hacking: Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms,

### Unit-II10

Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering System and Network Vulnerability and Threats to Security , Various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography,

### Unit-III 10

Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow,

### Unit-IV15

Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking Basic ethical hacking tools and usage of these tools in a professional environment. Legal, professional and ethical issues likely to face the domain of ethical hacking. Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.

TOTAL LECTURE: 45

### REFERENCES:

1. Dominic Chell , Tyrone Erasmus, Shaun Colley, Ofie Whitehouse, The Mobile Application Hacker's Handbook , Wiley
2. Michael Gregg, "Certified Ethical Hacker (CEH) Cert Guide", Pearson India, 2014
3. Rafay Baloch, "Ethical Hacking and Penetration Testing Guide" CRC Press
4. Allen Harper , Shome Harris, Jonathan Ness ,Chris Eagle, Gideon Lenkey,TerronVilliams "Gray Hat Hacking The Ethical Hakers Handbook." TMH
5. Patrick Engebretson, "The Basics of Hacking and Penetration Testing, Second Edition:Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Elsevier
6. Jon Erickson "HACKING, The art of Exploitation", William Pollock.

## SOFTWARE PROJECT MANAGEMENT

## UNIT-I:

## Introduction and Software Project Planning

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

## UNIT-II:

## Project Organization and Scheduling

10

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

## UNIT-III:

Project Monitoring and Control<sup>10</sup>

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

## UNIT-IV:

Software Quality Assurance and Testing<sup>10</sup>

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

## UNIT-V:

Project Management and Project Management Tools<sup>10</sup>

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

TOTAL LECTURE: 45

## REFERENCES:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

5. Harold R. Kerzner, Project Mangment “A Systems Approach to Planning, Scheduling, and Controlling” Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.

## CRYPTOGRAPHY & NETWORK SECURITY

**NIT-701**

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**Unit-I**

**10**

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.  
 Modern Block Ciphers: Block ciphers principles, Shannon’s theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

**Unit-II**

**10**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,  
 Advanced Encryption Standard (AES) encryption and decryption Fermat’s and Euler’s theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA

**Unit-III**

**10**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)  
 Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

**Unit-IV**

**10**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.  
 Authentication Applications:  
 Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.

**Unit-V**

**10**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.  
 Introduction to Secure Socket Layer, Secure electronic, transaction (SET)  
 System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

**TOTAL: 45 PERIODS**

**Text Books:**

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmabhan Cryptography and Security ,Wiley
4. Bruce Schneier, "Applied Cryptography". John Wiley & Sons
5. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
6. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill

## ARTIFICIAL INTELLIGENCE

NCS-702

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3 1 0

### **Unit-I**

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Processing.

### **Unit-II**

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

### **Unit-III**

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

### **Unit-IV**

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

### **Unit-V**

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

**TOTAL LECTURE: 45**

### **Text Books:**

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

# SOFTWARE TESTING AND AUDIT

NCS-071

**L T P**  
**3 1 0**

## **Unit-I**

### **Review of Software Engineering:10**

Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing AllPaths.

### **Verification:**

Verification methods, SRS verification, Source code reviews, User documentation verification, Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

## **Unit –II**

### **Functional Testing::10**

Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

### **Structural Testing:**

Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing.

## **Unit-III**

### **Regression Testing::10**

What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique.

### **Reducing the number of test cases:**

Prioritization guidelines, Priority category, Scheme, Risk Analysis.

## **Unit-IV:10**

**Software Testing Activities:** Levels of Testing, Debugging, Testing techniques and their Applicability, Exploratory Testing

### **Automated Test Data Generation:**

Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

## **Unit-V:5**

**Object oriented Testing:** Definition, Issues, Class Testing, Object Oriented Integration and System Testing.

**Testing Web Applications:** What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing. **(8 hrs)**

**TOTAL LECTURE: 45**

### **Text Books:**

1. Yogesh Singh, “Software Testing”, Cambridge University Press, New York, 2012
2. K.K. Aggarwal&Yogesh Singh, “Software Engineering”, New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.
4. Marc Roper, “Software Testing”, McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, “Software System Testing and Quality Assurance”, Van NostrandReinhold, New York, 1984.

## NEURAL NETWORKS

NCS-072

L T P  
3 1 0

### Unit-I:

#### Neuro Computing and Neuroscience

10

Historical notes, human Brain, neuron Mode I, Knowledge representation, AI and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

### Unit-II:

#### Data processing

10

Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

### Unit-III

10

Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.

### Unit-IV

10

Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

### Unit-V

5

Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

**TOTAL LECTURE: 45**

### REFERENCES:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Kosko, Neural Network and Fuzzy Sets, PHI
5. Hagan, Neural Network Design w/CD, Cengage Learning

## IT IN FORENSIC SCIENCE

**NIT-071**

**L    T    P**  
**3   1   0**

### **UNIT I 8**

Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security. Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans. Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification

### **UNIT II 8**

Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

### **UNIT III 8**

A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques. Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

### **UNIT IV 12**

Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system. Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin-Fourier Transformation, Wavelets, Split Images in Perceptual Bands. Applications of Transformation in Steganography.

### **UNIT V 8**

Computer Forensics, Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare,

**TOTAL LECTURE: 44**

### **Text Books:**

1. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.
2. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
3. Bolle, Connell et. al., "Guide to Biometrics", Springer
4. John Vecca, "Computer Forensics: Crime scene Investigation", Firewall Media 5. Christopher L.T. Brown, "Computer Evidence: Collection and Preservation", Firewall Media

## HIGH SPEED NETWORKS

**NCS-074**

**L    T    P**  
**3    1    0**

### **UNIT I 8**

Frame Relay Networks – Asynchronous transfer mode–ATM Protocol Architecture ,ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet – Gigabit Ethernet– Fiber Channel – Wireless LAN's, WiFiand WiMax Networks applications, requirements – Architecture of 802.11.

### **UNIT II 8**

Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet SwitchingNetworks – Frame Relay Congestion Control.

### **UNIT III12**

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management –Exponential RTO backoff – KARN's Algorithm – Window management – Performance ofTCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes –Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR ratecontrol, RM cell formats – ABR Capacity allocations – GFR traffic management.

### **UNIT IV 8**

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline– FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

### **UNIT V 8**

RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms– Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP– Protocol Architecture – Data Transfer Protocol– RTCP.

**TOTAL: 44 PERIODS**

#### **Text Books:**

1. William Stallings, “High speed networks and internet”, Second Edition, Pearson Education, 2002
2. Warland, Pravin Varaiya, “High performance communication networks”, Second Edition , Jean Harcourt Asia Pvt. Ltd., , 2001
3. Irvan Pepelnjk, Jim Guichard, Jeff Aparcar, “MPLS and VPN architecture”, Cisco Press, Volume 1 and 2, 2003.
4. Abhijit S. Pandya, Ercan Sea, “ATM Technology for Broad Band Telecommunication Networks”, CRC Press, New York, 2004.

# ANDROID OPERATING SYSTEM

NCS-075

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## **UNIT I**

### **Android OS**

Android Software Stack, Activities and Applications, Activity Life Cycles, Activity Stacks, Activity States, Resources, Android OS vs. IOS

## **UNIT II**

### **User Interfaces**

Views, Layouts, Android Widgets, UI XML Specifications, Explicit Intents, Implicit Intents, Event Broadcasting with Intents, Event Reception with Broadcast Receivers, Adapters and Data Binding.

## **UNIT III**

### **Multimedia**

Audio, Video, Camera, Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures

## **UNIT IV**

### **Networking**

Internet Access, HTML and XML Parsing, Wi-Fi

## **UNIT V**

### **Touchscreen**

Capturing Touch Events, Touchscreen Gesture Recognition

## **TOTAL: 44 PERIODS**

### **Text Books:**

1. Rito Meier. "Professional Android 2 Application Development." Wiley Publishing, Inc.
2. SayedHashimi, SatyaKomatineni, Dave MacLean. "Pro Android 2." APRESS.
3. Mark Murphy. "Beginning Android 2." APRESS.
4. Carmen Delessio,LaurenDarcey "Android Application Development" Pearson
5. J.F.DiMarzio "Android a programming guide" TMH

## SERVICE ORIENTED ARCHITECTURE

**NCS-076**

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**UNIT I** **10**

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate -Principles of service orientation

**UNIT II** **10**

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

**UNIT III** **10**

Service oriented analysis – Business-centric SOA – Deriving business services- service modeling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Taskcentric business service design

**UNIT IV** **10**

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE).

**UNIT V** **5**

WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WSSecurity

**TOTAL: 45 PERIODS**

**Text Books:**

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, and Design”, Pearson Education, 2005.
2. Newcomer, Lomow “Understanding SOA with Web Services”, Pearson Education, 2005.
3. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services, An Architect’s Guide”, Pearson Education, 2005.
4. Dan Woods and Thomas Mattern, “ Enterprise SOA Designing IT for Business Innovation” O’REILLY, First Edition, 2006
5. Kambhampaty Service Oriented Architecture for Enterprise and cloud applications , Wiley

# DISTRIBUTED SYSTEMS

NCS-701

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## **Unit-I**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

## **Unit-II**

**10**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

## **Unit-III**

**10**

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

## **Unit-IV**

**10**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

## **Unit -V**

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

**TOTAL LECTURE: 45**

### **Text Books:**

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna, Gehrke, "Database Management Systems", McGraw Hill
3. Vijay K. Garg Elements of Distributed Computing, Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenenbaum, Steen, "Distributed Systems", PHI
6. Gerald Tel, "Distributed Algorithms", Cambridge University Press

## COMPUTER VISION

NCS-073

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### **UNIT 1**

#### **IMAGE FORMATION MODEL**

**10**

Monocular Imaging System, Orthographic & Perspective Projection, Camera model and Camera calibration , Binocular imaging systems

### **UNIT 2**

#### **IMAGE PROCESSING AND FEATURE EXTRACTION**

**10**

Image representations (continuous and discrete), Edge detection

### **UNIT3**

#### **MOTION ESTIMATION**

**5**

Regularization Theory, Optical Computation, Stereo Vision, Motion Estimation, Structure from Motion.

### **UNIT 4**

#### **SHAPE REPRESENTATION AND SEGMENTATION**

**10**

Shape Representation and Segmentation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and Wavelet Descriptors, Medial Representations ,Multiresolution analysis

### **UNIT 5**

#### **OBJECT RECOGNITION**

**10**

Hough transforms and other simple object recognition Methods, Shape Correspondence and Shape Matching, Principal component analysis , Shape priors for recognition

**TOTAL LECTURE: 45**

#### **Text Books:**

1. Richard Szeliski, Computer Vision: Algorithms and Applications, 2010
2. Forsyth and Ponce, Computer Vision, A Modern Approach, 2nd ed., 2011
3. Trucco and Verri, Introductory Techniques for 3D Computer Vision, 1998
4. David A. Forsyth, "Computer Vision: : A Modern Approach", 2nd Edn, Pearson India 2015

## CRYPTOGRAPHY AND NETWORK SECURITY LAB

**NIT-751**

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The following programs should be implemented preferably on 'UNIX' platform using 'C' language (for 1-5) and other standard utilities available with 'UNIX' systems (for 6-8) :-

1. Implement the encryption and decryption of 8-bit data using 'Simplified DES Algorithm' (created by Prof. Edward Schaefer) in 'C'.
3. Implement 'Linear Congruential Algorithm' to generate 5 pseudo-random numbers in 'C'.
4. Implement Rabin-Miller Primality Testing Algorithm in 'C'.
5. Implement the Euclid Algorithm to generate the GCD of an array of 10 integers in 'C'.
6. Implement RSA algorithm for encryption and decryption in 'C'
7. Configure a mail agent to support Digital Certificates, send a mail and verify the correctness of this system using the configured parameters.
8. Configure SSH (Secure Shell) and send/receive a file on this connection to verify the correctness of this system using the configured parameters.
9. Configure a firewall to block the following for 5 minutes and verify the correctness of this system using the configured parameters:
  - (a) Two neighborhood IP addresses on your LAN
  - (b) All ICMP requests

## NON-CONVENTIONAL ENERGY RESOURCES

NOE-081

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### UNIT-I

#### Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. 3

#### Solar Cells:

Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. 4

### UNIT-II

#### Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. 9

### UNIT-III Geothermal

#### Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. 4

#### Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations. 2

#### Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations. 3

### UNIT-IV

#### Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations. 2

#### Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. 6

### UNIT-V

#### Bio-mass:

Availability of bio-mass and its conversion theory. 2

#### Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

#### Wave and Tidal Wave:

Principle of working, performance and limitations.

#### Waste Recycling Plants. 3

#### Text/References Books:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International. 5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

## NON-LINEAR DYNAMIC SYSTEMS

NOE-082

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### UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.

Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories. 8

### UNIT-II

#### STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunov functions, Lasalle's invariance principle. 7

### UNIT-III

#### Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brockett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems. 8

### UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. 8

### UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy); control of chaos. 9

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

## PRODUCT DEVELOPMENT

NOE- 083

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### UNIT-1

Concept of Product, definition and scope.

Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical reliability & economic feasibility of design concepts.

### UNIT –II

Morphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.

Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.

### UNIT –III

Transformations, Brainstorming& Syntetics, Morphological techniques.

Utility Concept, Utility Value, Utility Index, Decision making under Multiple Criteria.

Economic aspects, Fixed and variable costs, Break-even analysis.

### UNIT-IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.

Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthropometric data and its importance in design.

Application of Computers in Product development & design.

### UNIT-V

Existing techniques, such as work-study, SQC etc. for improving method & quality of product.

Innovation versus Invention. Technological Forecasting.

Use of Standards for Design.

Text/Reference Books:

3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)

4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.

5. C.D. Cain, “Product Design & Decision” Bussiness Books.

7. C.D. Cain, “Engg. Product Design” Bussiness Books.

1. Introduction: Definition, Classification of Robots, geometric classification and control classification.
2. Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. Robot Coordinate Systems and Manipulator Kinematics: Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.  
Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. Robot Control: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control, and introduction to robot vision.
5. Robot Programming: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. Applications: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

## Text/Reference Books:

1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill.
6. Asfahl, "Robots & Manufacturing Automat (c)All TCP SYN Packets

## MOBILE COMPUTING

**NIT-801**

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**Unit – I**

**8**

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

**Unit – II**

**12**

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

**Unit – III**

**8**

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

**Unit – IV**

**8**

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

**Unit – V**

**8**

Ad-hoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

**TOTAL: 44 PERIODS**

**Text Books:**

1. Thampi - Mobile Communications and Computing ,Wiley
2. J. Schiller, Mobile Communications, Addison Wesley.
3. Charles Perkins, Mobile IP, Addison Wesley.
4. Charles Perkins, Ad hoc Networks, Addison Wesley.
5. Upadhyaya, “Mobile Computing”, Springer
6. Stojmenovic, Handbook of Wireless Networks and Mobile Computing, Wiley India.

# PATTERN RECOGNITION

NCS-080

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## **Unit-I**

### **Introduction: 8**

Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

## **Unit-II**

### **Statistical Patten Recognition: 8**

Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

## **Unit – III**

### **Parameter estimation methods:12**

Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

## **Unit - IV**

### **Nonparametric Techniques:8**

Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

## **Unit - V**

### **Unsupervised Learning & Clustering: 8**

Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

## **TOTAL: 44 PERIODS**

### **Text Books:**

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2<sup>nd</sup> Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4<sup>th</sup> Edition, Academic Press, 2009.
4. Pattern Recognition, Narasimha Murty, Universities Press.
5. Pattern Recognition and Image Analysis, Gose, Johnsonbaugh & Jost, PHI Learning.
6. PATTERN RECOGNITION: TECHNIQUES AND APPLICATIONS, SHINGHAL, OXFORD UNIVERSITY PRESS.

## REAL TIME SYSTEM

NCS-082

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### **UNIT-I:**

#### **Introduction**

**5**

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

### **UNIT-II:**

#### **Real Time Scheduling**

**10**

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

### **UNIT-III:**

#### **Resources Sharing**

**10**

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

### **UNIT-IV:**

#### **Real Time Communication**

**10**

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

### **UNIT-V:**

#### **Real Time Operating Systems and Databases**

**10**

Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

**TOTAL: 45 PERIODS**

#### **Text Books:**

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta, Seppo J. Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, "Real Time Systems", Pearson Education
4. Albert M. K. Cheng, "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley.
5. KRISHNA, Real-Time Systems, Mc Graw Hills

## GRID COMPUTING

**NCS-084**

<b>L</b>	<b>T</b>	<b>P</b>
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### **UNIT I**

#### **CONCEPTS AND ARCHITECTURE**

**10**

Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

### **UNIT II**

#### **GRID MONITORING**

**10**

Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE – JAMM - MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon

### **UNIT III**

#### **GRID SECURITY AND RESOURCE MANAGEMENT**

**10**

Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

### **UNIT IV**

#### **DATA MANAGEMENT AND GRID PORTALS**

**10**

Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective, Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

### **UNIT V**

#### **GRID MIDDLEWARE**

**5**

List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features

### **TOTAL: 45 PERIODS**

#### **Text Books:**

1. JoshyJoseph, CraigFellenstein—Grid Computing, Pearson Education, 2004.
2. Vladimir Silva—Grid Computing for Developers,DreamtechPress, 2006.
3. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality
4. AhmarAbbas--Grid Computing —A Practical Guide to Technology and Applications, Firewall Media, 2006.
5. Joshy Joseph, Craig Fellenstein, Grid Computing, Pearson Education.
6. Grid Computing Security, Anirban Chakrabarti, Springer, 2007.

# Digital Image Processing

NCS-801

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## **UNIT-I**

### **Introduction and Fundamentals**

**10**

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

### **Image Enhancement in Frequency Domain**

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

## **UNIT-II**

**10**

### **Image Enhancement in Spatial Domain**

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

## **UNIT-III**

### **Image Restoration**

**10**

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

## **UNIT-IV**

**10**

### **Morphological Image Processing**

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

## **UNIT-V Registration**

**5**

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

### **Segmentation**

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

**TOTAL: 45 PERIODS**

### **Text Books:**

1. Digital Image Processing 2<sup>nd</sup> Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle
4. Sonka, Digital Image Processing and Computer Vision, Cengage Learning
5. Gonzalez and Woods, Digital Image Processing, Addison Wesley.

## Natural Language Processing

**NIT-080**

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### Unit-I

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

### Unit-II

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

### Unit-III

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

### Unit-IV

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

### Unit-V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

### References:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

## DATA COMPRESSION

NCS-085

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**Unit - I:**

**10**

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

**Unit – II:**

**10**

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

**Unit-III:**

**10**

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markov Compression.

**Unit – IV:**

**10**

Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

**Unit-V:**

**5**

Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured Vector Quantizers.

**TOTAL: 45 PERIODS**

**Text Books:**

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression, Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition, Khalid Sayood, The Morgan Kaufmann Series
4. Data Compression: The Complete Reference 4th Edition by David Salomon, Springer
5. Text Compression 1st Edition by Timothy C. Bell Prentice Hall.

## EMBEDDED SYSTEMS

NCS-087

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**Unit-I** **10**

Introduction to embedded systems: Classification, Characteristics and requirements, Applications

**Unit-II** **10**

Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

**Unit-III** **10**

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing. Modeling and Characterization of Embedded Computation System.

**Unit-IV** **10**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

**Unit-V** **5**

Fault-Tolerance, Formal Verification , Trends in Embedded Processor, OS, Development Language

### References:

1. Prasad, Embedded /Real Time System, Concept, Design and Programming Black Book, Wiley India
2. H.Kopetz, "Real-Time Systems", Kluwer
3. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
4. Shibu K.V., "Introduction to Embedded Systems", TMH
5. Marwedel, "Embedded System Design", Springer

SEMANTIC WEB AND WEB SERVICES

**NCS-088**

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3    1    0

**UNIT I**

**12**

Introduction to Semantic Web: History of Semantic Web, goals and vision, problems, Semantic Web Technologies, Layered Approach, Syntactic vs semantic web, Applications of semantic web.

**UNIT II**

**8**

Architecture: XML with Document Type Definitions and Schema, addressing and querying XML documents, RDF (Resource Description Framework), basic idea and syntax, querying in RQL, URI(8 Hrs.)

**UNIT III**

**8**

Ontologies: Role of Ontology in intelligent information retrieval on web, OWL, Ontologies for different applications. Ontology engineering: constructing ontologies manually, reusing existing ontologies.

**UNIT IV**

**8**

semantics, use of semantics, Search Engines: Role of search Engines in intelligent retrieval of information on web, Semantic web browsers. Semantics: Kinds of

**UNIT V**

**8**

Logic and inference: examples of Monotonic rules: family relationships, monotonic rules: syntax and semantics, Non-monotonic rules: Motivation and syntax, Non-monotonic rule example: and Brokered Trade, Rule Mark-up XML: Monotonic and Non-Monotonic rules.(8 Hrs.)

**References:-**

1. Salam, A. F., ed. SemanticWeb Technologies and E-Business: Toward the Integrated Virtual Organization and Business Process Automation:. IGI Global, 2006.
2. Cardoso, Jorge, ed. Semantic Web Services: Theory, Tools and Applications: Theory, Tools and Applications. IGI Global, 2007.
3. Antoniou, Grigoris, and Frank Van Harmelen. A semantic web primer. MIT press, 2004.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, CRC Press
5. Daconta, Michael C., Leo J. Obrst, and Kevin T. Smith. The semantic web: a guide to the future of XML, web services, and knowledge management. John Wiley & Sons, 2003.

# SOFTWARE QUALITY ENGINEERING

NIT-081

<b>L</b>	<b>T</b>	<b>P</b>
3	1	0

## **UNIT-I:**

### **Introduction**

**8**

Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

## **UNIT-II:**

### **Software Quality Metrics**

**8**

Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

## **UNIT-III:**

### **Software Quality Management and Models**

**8**

Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

## **UNIT-IV:**

### **Software Quality Assurance**

**12**

Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

## **UNIT-V:**

### **Software Verification, Validation & Testing:**

**8**

Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

**TOTAL: 44 PERIODS**

#### **Text Books**

1. Jeff Tian, Software Quality Engineering (SQE), Wiley
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley
3. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
4. Royce, Software Project Management, Pearson Education
5. Kieron Conway, Software Project Management, Dreamtech Press
6. S. A. Kelkar, Software Project Management, PHI Publication.

## SOFTWARE RELIABILITY

NIT-082

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<b>3</b>	<b>1</b>	<b>0</b>

### **UNIT-I:**

#### **Introduction**

**8**

Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

### **UNIT-II:**

#### **Software Reliability Metrics**

**8**

Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

### **UNIT-III:**

#### **Software Reliability Assessment Models**

**8**

Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

### **UNIT-IV:**

#### **Software Reliability Allocation Models**

**8**

Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal Reliability Allocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

### **UNIT-V:**

#### **Software Reliability Techniques**

**12**

Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

### **TOTAL: 44 PERIODS**

#### **Text Books**

1. John Musa, "Software Reliability Engineering", McGraw-Hill
2. Fenton, and Pfleeger, "Software Metrics: A Rigorous and Practical Approach", International Thomson Computer Press
3. Jeff Tian, Software Quality Engineering (SQE), Wiley
4. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley