Shri Guru Gobind Singhji Institute of Engineering and Technology, Vishnupuri, Nanded

DEPARTMENT OF INFORMATION TECHMOLOGY

Curriculum Structure of B.Tech

(with effective from 2021-2022)

	SEMESTER – I					
Course Code	**Course Title**	**Lectures (L)**	**Tutorials (T)**	**Practical (P)**	**Credits**	
					Th	***Pr***
PCC-IT401	Cryptography and Network Security	03	--	02	03	01
PCC-IT402	Mobile and Wireless Communication	03	--	02	03	01
PCC-IT403	Internet of Things	03	--	02	03	01
PEC-IT4**	Elective – III	03	--	02	03	01
PEC-IT4**	Elective – IV	03	01	--	04	--
LAB-IT412	Computer Laboratory - V	--	--	02	--	01
PRJ-IT413	Project -I	--	--	06	--	03
		15	**01**	**16**	**24**	
SEMESTER – II (Structure-A)						
Course Code	**Course Title**	**Lectures (L)**	**Tutorials (T)**	**Practical (P)**	**Credits**	
					Th	***Pr***
PRJ-IT414	Project –II (Internship)	---	--	32	--	16
	Total	**---**	**---**	**32**	**16**	
SEMESTER – II (Structure-B)						
PRJ-IT415	Project –II (In-house)	--	--	24	--	12
OEC-IT4**/ OEC-**4**	Elective-V	03	01	--	04	--
	Total	**03**	**01**	**24**	**16**	

L - No. of Lectures Hours/week, T - No. Tutorial Hours/week, P - No. Practical hours/week

B.Tech (INFT)	**Contact hours**	**Credits**
TOTAL	64/60	40

Elective – III		**Elective – IV**	
PEC-IT404	Optimization Techniques	PEC-IT408	Advanced Operating Systems
PEC-IT405	Image Processing	PEC-IT409	Human Computer Interaction
PEC-IT406	Pattern Recognition	PEC-IT410	Soft Computing
PEC-IT407	Deep Learning	PEC-IT411	Information Theory and Coding

Elective – V (Open Elective)	
OEC-IT416	Data Mining Data Warehouse
OEC-IT417	Artificial Intelligence
OEC-IT418	Robotics
OEC-IT419	Management Information System

NOTE:

Students can choose a course from Open Elective offered by department / Institute Open Elective (Offered by any other department) / MOOC

SEMESTER - I

PCC-IT-401: CRYPTOGRAPHY AND NETWORK SECURITY

(Total Credits: 4, Lecture/week: 3, Practical/week: 2)

COURSE OBJECTIVES:

1. The concepts of classical encryption techniques and concepts of finite fields and number theory.
2. Explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
3. Explore the design issues and working principles of various authentication protocols, PKI standards.
4. Explore various secure communication standards including Kerberos, IPsec, and SSL/TLS and email.
5. The ability to use existing cryptographic utilities to build programs for secure communication.

COURSE CONTENTS:

1. **Introduction to Security:**
    1. Introduction: attacks, services, mechanism, security attacks, security services, model of internet work security
    2. Conventional Encryption Classical techniques - conventional encryption model, steganography
    3. Modern techniques- simplified DES, Block cipher principles, DES, Strength of DES, differential and linear cryptanalysis, block cipher design principles, modes of operation.
    4. Algorithms: Triple DES, International DE algorithm, Blowfish, RC-5, Cast-128, Characteristics of advanced symmetric block ciphers
    5. Confidentiality using conventional encryption: Placement of encryption function, traffic confidentiality, key distribution, random number generation.

2. **Public Key Encryption and Hash Functions:**
    1. Public key cryptography: Principles, RC algorithm, key management, Diffie-Hellman key exchange, Elliptic curve cryptography
    2. Introduction to number theory, prime and relatively prime numbers, modular arithmetic, Fermat's and Euler's theorem, testing for primality, Euclid's algorithm, Chinese remainder theorem, discrete algorithms.
    3. Message Authentication and Hash functions: Authentication requirements, Authentication functions, message authentication codes, hash functions, security of hash functions and MACs
    4. Hash and MAC Algorithm: MD5 message digest algorithm, secure hash algorithm (SHA-512), RIPEMD-160, HMAC , Digital signature and authentication protocols, Digital signature standard

3. **Network Security Practice:**
    1. Authentication Applications: Kerberos, X.5.9 directory authentication service
    2. Electronic mail security: PGP, S/MIME
    3. IP Security: Overview and architecture, authentication header, encapsulating security payload, combining security associations, key management
    4. Web security: requirements, secure sockets layer and transport layer security, secure electronic transaction

5. **System Security and Firewalls:**
    1. Intruders, viruses, and worms, firewalls, firewall design principles, trusted systems.

TEXT/ REFERENCE BOOKS:

1. William Stallings, Cryptography and Network Security: Principles and Practice, Prentice Hall Pearson Education, 2000.
2. Network Security Fundamentals, Peter Norton, Techmedia Publications.
3. Bernard Menezes, "Network Security and Cryptography", Cengage Learning.
4. Practical Cryptography, Bruce Scheneir, Wiley Internationals.

COURSE OUTCOMES (CO):

After learning this course students will be able to

CO1. Explain the need of information security, its awareness, and history of computer Security, threats and attacks associated with it.
CO2. Solve various problems in number theory, Public Key Encryption algorithms.
CO3. Design and develop encryption/ decryption algorithms using open source tools.
CO4. Analyse the various techniques of encryption, key management in security, Secure Electronic Transaction.
CO5. Describe the basics of Web Security, IP Security, Intrusion Detection Systems, Cyber-crime and prepare brief report on it.

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1		3	2												
CO2	3	3		2	3								3	3	
CO3	3	3	2		3			1	2	2			3	3	3
CO4		3			3			1	2				2	2	1
CO5		3							2	2		3			

PCC-IT-402: MOBILE AND WIRELESS COMMUNICATIONS

(Total Credits: 3, Lecture/week: 3, Practical/week: 2)

COURSE OBJECTIVES:

1. The student will be able to analyze and design wireless and mobile cellular systems.
2. The student will have the ability to work in advanced research wireless and mobile cellular programs.

COURSE CONTENTS:

1. Introduction to Wireless Communication Systems: - Evaluation of Mobile Radio Communications, Mobile Radio Systems around the World, Examples of wireless Communication Systems, Trends in Cellular Radio & Personal Communications

2. Modern Wireless Communication systems:-

Second Generation Cellular Networks, Third Generation Wireless Networks, Wireless Local Loop & LMDS, Wireless Local Area Networks, Blue Tooth & Personal Area Networks.

3. The Cellular Concepts:-

System design fundamentals: Introduction, Frequency reuse, Channel Assignment Strategies, Handoff Strategies, Interference & System Capacity, Trunking & Grade of service, improving coverage & capacity in cellular systems.

4. Wireless LANs:-
Infrared Vs Radio Transmission, Infrastructure & ad-hoc n/ws, IEEE 802.11 HIPERLAN, Bluetooth

5. Wireless WANs: -
GSM & TDMA technology, CDMA technology, IS-95, IMT- 2000, Mobile data n/ws

6. Wireless ATMs: -
Motivation for WATM, WATM services, Reference Model, Functions, Radio Access layers, Handover, Location Management, Addressing, Mobile QOS, Access Point Control Protocol.

7. Wireless Application Protocol:-
Architecture, WDP, WTP, WSP, WML, WML Script, Wireless Telephone Applications, Examples Stacks with WAP.

TEXT/REFERENCE BOOKS:

1. Wireless Communications: PRINCIPLES & PRACTISE, T.S.RAPPAPORT, Pearson Education.
2. Mobile Communications, Jochen Schiller, Pearson Education
3. Principles Of Wireless Networks, Kaveh Pahlavan, Prashant Krishnamurthy, Pearson Education

COURSE OUTCOMES (CO):

After successful completion of this course, the students will be able to:

CO1: Explain the fundamental physical and technical features of mobile and wireless Communications systems.
CO2: Describe the fundamental principles of the mobile and wireless communications systems.
CO3: Describe the implementation and development of mobile and wireless communication System.
CO4: Interpret the information gathered and the outcomes of measurements.
CO5: Conduct field tests and measurements of devices, equipment, actual components and system in the laboratory.
CO6: Test the technical features of mobile and wireless communication equipment.

ARTICULATION MATRIX:

(3) High, (2) Medium, (1) Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1									1	3	2	
CO2				2	1						2		3	3	
CO3	2	2	2			2							2	2	
CO4				1											2
CO5	2	2													1
CO6	3		2	1	3	1					1	1			3

PCC-IT403: Internet of Things

(Total Credits: 4, Lecture/week: 3, Practical/week: 2)

COURSE OBJECTIVES:

1. Students will be explored to the interconnection and integration of the physical world and the cyber space.
2. They are also able to design & develop IOT Devices.

COURSE CONTENTS:

1. **Introduction & Concepts:**

Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

2. **Domain Specific IOTs:**

Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

3. **M2M & System Management with NETCONF-YANG:**

M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

4. **Developing Internet of Things & Logical Design using Python:**

Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages.

5. **IOT Physical Devices & Endpoints:**

What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming & IOT Devices.

TEXT/ REFERENCE BOOKS:

1. Vijay Madisetti, Arshdeep Bahga," Internet of Things A Hands-On- Approach.
2. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN: 978-1-118 43062-0
3. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN 0989973700

COURSE OUTCOMES (CO):

After successful completion of this course, the students will be able to:

CO1. Able to understand the application areas of IOT

CO2. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.

CO3. Able to understand building blocks of Internet of Things and characteristics.

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**D**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3		3	3								2		
CO2		3		3	3									3	
CO3		3		3	3										2

PEC-IT4** Elective – III

(Total Credits: 4, Lecture/week: 3, Practical/week: 2)

PEC-IT404: Optimization Techniques

COURSE OBJECTIVES:

1. Cast engineering minima/maxima problems into optimization framework.
2. Learn efficient computational procedures to solve optimization problems.
3. Use Matlab to implement important optimization methods.

COURSE CONTENTS:

1. Mathematical preliminaries:

Linear algebra and matrices, Vector space, eigen analysis, Elements of probability theory Elementary multivariable calculus

2. Linear Programming:

Introduction to linear programming model, Simplex method, Duality, Karmarkar's method

3. Unconstrained optimization:

One-dimensional search methods, Gradient-based methods, Conjugate direction and quasi-Newton methods

4. Constrained Optimization:

Lagrange theorem , FONC, SONC, and SOSC conditions

5. Non-linear problems:

Non-linear constrained optimization models, KKT conditions, Projection methods.

TEXT/ REFERENCE BOOKS:

1. An introduction to Optimization by Edwin P K Chong, Stainslaw Zak
2.. Nonlinear Programming by Dimitri Bertsekas

COURSE OUTCOMES (CO):

After successful completion of this course, the students will be able to:

CO1. Be able to model engineering minima/maxima problems as optimization problems.

CO2. Be able to use Matlab to implement optimization algorithm.

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3		3	3	2							3		
CO2		3		3	3								3		3

PEC-IT405: Image Processing

COURSE OBJECTIVES:

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques
3. To study image restoration procedures.
4. To study the image compression procedures.

SYLLABUS:

1. **Computer Imaging Systems Overview:** lenses, Image formation and sensing, CVIP lab, Elements of digital image processing: Image model, Sampling and quantization, Relationships between pixels.
2. **Image Analysis:** pre-processing, Binary image analysis. Image Transforms: Fourier transform, Hough transform.
3. **Image Enhancement:** Enhancement by point processing, Spatial filtering, Enhancement in the frequency domain, Color Image Processing
4. **Image Segmentation:** Edge detection, Edge detection performance, Discontinuity detection, Thresholding, Region oriented segmentation, Use of motion for segmentation.
5. **Representation and Description:** Boundary description, Regional description.
6. **Morphological filtering:** Morphological Image Processing, Dilation and Erosion, Opening and Closing, Some basic morphological algorithms.
7. **Feature Extraction,**: shape, histogram, color, spectral, texture, using CVIP tools.
8. **Feature Analysis:** feature vectors, distance /similarity measures, data pre-processing, Pattern classification.

TEXT/ REFERENCE BOOKS:

1. Digital Image Processing - R.C.Gonzalez & P.Wintz
2. Digital Image Processing - W. K. Pratt
3. Computer Vision - D.H.Ballard & C.M.Brown
4. Fundamentals of Digital Image Processing - A.K. Jain
5. Algorithms for Graphics and Image Processing, Theo Pavlidis, Computer Science
6. Digital Picture Processing - A. Rosenfeld and A.C. Kak

COURSE OUTCOMES (COs)

CO1: Review the fundamental concepts of a digital image processing system.
CO2 : Analyse images in the frequency domain using various transforms.
CO3 : Evaluate the techniques for image enhancement and image restoration.
CO4 : Categorize various compression techniques. CO5: Interpret Image compression standards.
CO5 : Interpret image segmentation and representation techniques.

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO 1**	**PSO 2**	**PSO 3**
CO1		3					2							3	
CO2				3										3	
CO3		3	3	2									3		
CO4		3													
CO5		3		3									2	3	3

PEC-IT406: Pattern Recognition

COURSE OBJECTIVES:

1. Understand basic concepts in pattern recognition
2. Gain knowledge about state-of-the-art algorithms used in pattern recognition research.
3. Understand pattern recognition theories, such as Bayes classifier, linear discriminate analysis.

COURSE CONTENTS:

1. **Introduction**

Introduction to patterns and pattern recognition application development

2. **Supervised pattern detection**

Bayes classifiers, linear classifiers, non-linear classifiers, neural networks, support vector machines, rule-based classifiers

3. **Feature extraction**

Feature extraction from multivariate data, image data

4. **Unsupervised pattern detection**

Clustering, self-organization, competitive learning

5. Deep learning, convolutional neural networks

6. Fuzzy logic, genetic algorithms, Sensor and data fusion

TEXT/ REFERENCE BOOKS:

1. Duda, Hart and Stork, *Pattern Classification*, Second Edition, Wiley, 2001.

COURSE OUTCOMES (CO):

After successful completion of this course, the students will be able to:

CO1. Understand pattern recognition theories.

CO2. Apply pattern recognition techniques in practical problems.

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3		3								3		
CO2		3		3	3									3	3

PEC-IT407: Deep Learning

COURSE OBJECTIVES:

1. To introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.

COURSE CONTENTS:

1. Introduction:

Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.

2. Feedforward neural network:

Artificial Neural Network, activation function, multi-layer neural network.

3. Training Neural Network:

Risk minimization, loss function, backpropagation, regularization, model selection, and optimization.

4. Conditional Random Fields:

Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.

5. Deep Learning:

Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.

6. Probabilistic Neural Network:

Hopfield Net, Boltzman machine, RBMs, Sigmoid net, Autoencoders.

7. Deep Learning research:

Object recognition, sparse coding, computer vision, natural language processing.

8. Deep Learning Tools:

Caffe, Theano, Torch.

TEXT/ REFERENCE BOOKS:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016..
2. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.

COURSE OUTCOMES (CO):

After successful completion of this course, students will be able to:

CO1. Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.

CO2. Implement deep learning algorithms and solve real-world problems.

Articulation Matrix:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3		3	3								3	2	
CO2			3	3	3									2	3

PEC-IT4** Elective – IV

(Total Credits: 4, Lecture/week: 3, Tutorials: 1)

PEC-IT408: Advanced Operating Systems

OBJECTIVES:

1. To study the fundamentals of OS and DOS
2. To understand the concept of Inter-process communication in distributed OS
3. To understand the synchronization in distributed OS
4. To understand the resource management distributed OS
5. To study and understand the recent type of advanced OS (Mobile OS)

COURSE CONTENTS:

1. **Introduction to OS and Distributed OS:** A simple OS – structure, processes, address spaces and threads, managing processes, loading programs into processes, Basic concepts: context switching – procedures, threads, system calls, interrupts. Distributed computing systems fundamentals: Introduction to Distributed computing systems, Models, Popularity. Distributed computing system, Design issues of Distributed operating system, distributed computing environment.

2. **Message Passing and Remote Procedure Calls**
   Features of a good Message Passing System. Issues in IPC by Message Passing Synchronization, Buffering, Multi-datagram Messages, Process Addressing, Failure handling. RPC Model, Implementing RPC Mechanism. Stub Generation. RPC Messages, Marshaling Arguments and Results. ParameterPassing semantics, call semantics, Communication protocols for RPC's, Client- Server Building, Exception handling.

3. **Distributed Shared Memory**
   General Architecture of DSM systems. Design and implementation Issues of DSM, Granularity, Structure of Shared Memory Space, Consistency models, Replacement strategy, Thrashing.

4. **Synchronization and Resource management in DS**
   Clock Synchronization. Event Ordering, Mutual Exclusion, Deadlock in the distributed systems, Election Algorithms. Resource Management: Features of global scheduling algorithm, Task assignment approach, Load-balancing and Load approach.

5. **Distributed File Systems**
   Features of good DFS, File models, File Accessing models. File- Sharing Semantics, File-Caching schemes, File Replication, Fault Tolerance, Automatic Transactions, Design Principles.

6. **Mobile Operating System**
   Mobile O.S.: Introduction, Kernel design in Mobile OS, Scheduling in Mobile OS, File systems on mobile phones, I/O in Mobile OS, Case study: Symbian or Android.

TEXT/ REFERENCE BOOKS:

1. Thomas W. Doeppner, Operating Systems in Depth, Wiley India, First Edition, ISBN No. 978-81- 2653709-9.
2. Dr. P. K. Sinha, Distributed Operating Systems: Concepts and Design, PHI, Second Edition, ISBN No. 978-0780311190.
3. Michael J. Jipping, Smartphone Operating System Concepts with Symbian OS: A Tutorial Guide, John Wiley & Sons, ISBN No. 978-0-470-06523-5.

4. Mukesh Singhal and Niranjan Shivaratri, Advanced Concepts In Operating System, Tata McGraw-Hill Education, ISBN No. 978-0070575721.
5. G.Coulouris, J. Dollimore, T. Kindberg & G. Blair, Distributed Systems concepts and design, Addison Wesley, Fifth Edition, ISBN No. 978-0-13-214301-1.

COURSE OUTCOMES (CO):

After successful completion of this course, students will be able to:

CO1: Understand the general concept of OS and DOS.

CO2: Understand and apply inter-process communication in the distributed OS

CO3: Understand the synchronization in distributed OS.

CO4: Understand the resource management distributed OS.

CO5: Study and understand the recent type of advanced OS (Mobile OS)

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO 1**	**PSO 2**	**PSO 3**
CO1		3			2									3	
CO2		3	3										3	3	
CO3		2			2								3	3	2
CO4		2											2	3	3
CO5		3	2										2	3	

PEC-IT409: Human Computer Interaction

COURSE OBJECTIVES:

1. Demonstrate an understanding of guidelines, principles, and theories influencing human Computer interaction.
2. Recognize how a computer system may be modified to include human diversity.
3. Select an effective style for a specific application.
4. Design mock-ups and carry out a user and expert evaluation of interfaces.
5. Carry out the steps of experimental design, usability and experimental testing, and evaluation of human-computer interaction systems.

COURSE CONTENTS:

1. FOUNDATIONS

The human, the computer, the interaction, Paradigms

2. DESIGN PROCESS

Interaction design basics, HCI in the software process, Design rules, Implementation Support, Evaluation techniques, Universal design, User support

3. MODELS AND THEORIES

Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis Dialog notations and design, Models of the system, Modeling rich interaction.

References:

1. Human–Computer Interaction Third Edition Alan Dix, Lancaster UniversityJanet Finlay, Leeds Metropolitan UniversityGregory D. Abowd, Georgia Institute of TechnologyRussell Beale, University of Birmingham
2. Sharp, H., Rogers, Y. & Preece, J. (2007). Interaction design: beyond human-computer interaction.Wiley (2nd ed.).
3. Carroll, J.M. (ed.) (2003). HCI models, theories and frameworks: toward a multi-disciplinary science. Morgan Kaufmann.
4. Cairns, P. & Cox, A. (eds.) (2008). Research methods for human-computer interaction. Cambridge University Press.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO1. To introduce the concept of human-computer-interaction in study.
CO2. To gain the knowledge of Interaction design methodologies.
CO3. To design and evaluate effective human-computer-interactions.
CO4. To study HCI models and theories.
CO5. To understand HCI design processes.
CO6. To introduce how to apply the Human-Computer Interaction concepts to the current interaction designs

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low														
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1		3					2							3	
CO2				3										3	
CO3		3	3	2									3		
CO4		3													
CO5		3		3									2	3	3
CO6				2	3										3

PEC-IT410: Soft Computing

COURSE OBJECTIVES:

1. Understand the concepts of Fuzzy logic (FL) will be covered first, followed by Artificial Neural Networks (ANNs) and optimization techniques using Genetic Algorithm (GA).

2. Understand applications of Soft Computing techniques to solve a number of real life problems will be covered to have hands on practices.

COURSE CONTENTS:

1. **Introduction to Soft Computing and Neural Networks:** Evolution of Computing - Soft Computing Constituents from Conventional AI to Computational Intelligence Machine Learning Basics.
2. **Genetic Algorithms:** Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning -Machine Learning Approach to Knowledge Acquisition.
3. **Neural Networks:** Machine Learning Using Neural Network, Adaptive Networks – Feed

forward Networks –Supervised Learning Neural Networks – Radial Basis Function Networks -Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

4. **Fuzzy Logic:** Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions-Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.
5. **Neuro-Fuzzy Modeling :**Adaptive Neuro-Fuzzy Inference Systems – Coactive NeuroFuzzy Modeling –Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – Neuro-Fuzzy Control – Case studies.

TEXT/ REFERENCE BOOKS:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications",Prentice Hall, 1995. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003.
3. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998.
4. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley, 1997. 22
5. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer, 2007.
6. Jacek M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishers, 1992

COURSE OUTCOMES (CO):

After successfully completing this course, students will be able to:

CO1. Students will be introduced to Fuzzy logic and its applications.

CO2. Student should have gain knowledge of artificial neural networks and its applications.

CO3. Student have to solve single-objective optimization problems using GAs.

CO4. Students should understand solving multi-objective optimization problems using Evolutionary algorithms (MOEAs).

CO5. Students will understand the basic concepts of Applications of Soft computing to solve problems in varieties of application domains.

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1		3					2							3	
CO2				3										3	
CO3		3	3	2									3		
CO4		3													
CO5		3		3									2	3	3

PEC-IT411: Information Theory and Coding

COURSE OBJECTIVES:

1. Understand the basics of information theory and coding theories.
2. Introduce the concept of amount of information, entropy, channel capacity, error detection and error-correction codes, block coding, convolution coding, and Viterbi decoding algorithm.
3. Understand and explain the basic concepts of information theory, source coding, Channel and channel capacity, channel coding and relation among them.

4. Describe the real life applications based on the fundamental theory.
5. Calculate entropy, channel capacity, bit error rate, code rate, and steady-state Probability and so on.
6. Implement the encoder and decoder of one block code or convolution code using any Program language

COURSE CONTENTS:

1. INFORMATION THEORY
Information – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended
Huffman coding – Joint and conditional entropies, Mutual information – Discrete memoryless channels – BSC, BEC – Channel capacity, Shannon limit.

2. SOURCE CODING: TEXT, AUDIO AND SPEECH
Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio:Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III,Dolby AC3 – Speech: Channel Vocoder, Linear Predictive Coding

3. SOURCE CODING: IMAGE AND VIDEO
Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression :READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard

4. ERROR CONTROL CODING: BLOCK CODES
Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding – Single parity codes, Hamming codes, Repetition codes – Linear block codes, Cyclic codes – Syndrome calculation, Encoder and decoder – CRC

5. ERROR CONTROL CODING: CONVOLUTIONAL CODES
Convolutional codes – code tree, trellis, state diagram – Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding

TEXT BOOKS :

1. R Bose, "Information Theory, Coding and Crptography", TMH 2007
2. Fred Halsall, "Multidedia Communications: Applications, Networks, Protocols and
3. Standards", Perason Education Asia, 2002
4. S Gravano, "Introduction to Error Control Codes", Oxford University Press 2007
5. Amitabha Bhattacharya, "Digital Communication", TMH 2006

COURSE OUTCOMES (CO):

After successfully completing this course, students will be able to:
CO1. Students will be introduced to the basic notions of information and channel capacity.
CO2. Students will be introduced to convolutional and block codes, decoding techniques, andautomatic repeat request (ARQ) schemes.
CO3. Students will be understood how error control coding techniques are applied in communication systems.
CO4. Students will understand the basic concepts of cryptography.

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1		3			2									3	
CO2		3	3										3	3	
CO3		2			2								3	3	2
CO4		2											2	3	3

LAB-IT412: COMPUTER LABORATORY-V (Adv. JAVA/Mobile Apps Dev)

COURSE OBJECTIVES:

1. Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.
2. To Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
3. To Design and develop Web and Mobile applications.
4. To Designing Enterprise based applications by encapsulating an application's business logic.
5. To learn how to employ Integrated Development Environment(IDE) for implementing and testing of software solution.

COURSE CONTENTS

ADVANCED JAVA:

1. **Data Structures in Java:** Enumeration, BitSet, Vector, Stack, Dictionary, Hash table, Properties.

2. **Generics and Collection Framework:** Generic Methods and Generic Classes. Interfaces (Set, List, Queue, and Dequeue) and classes (ArrayList, Vector, LinkedList, PriorityQueue, HashSet, LinkedHashSet, and TreeSet).

3. **Serialization and Networking:** Serializing an Object and Deserializing an Object, Socket Programming.

4. **Database Connectivity and Multithreading:** SQL, JDBC, Thread life cycle, Thread methods, Thread Pools, Executor Service.

5. **GUI in JAVA:** AWT, Applet, Swing

MOBILE APPLICATION DEVELOPMENT:

1. **Introduction to Android**: Android Platform Architecture, Basic components of android, Features of ART and Delvik Virtual Machine, Activity Life Cycle, Intents and Intent Filters, Resources, System Permissions, Android Application Structure, Device screen size compatibility, Android Emulator.

2. **User Interface components:** Layouts, Recycler View, List View, Grid View and Web view, Input Controls: Buttons, Checkboxes, Radio Buttons, Toggle Buttons, Spinners, Input Events, Menus, Toast, Dialogs, Styles and Themes.

3. **Multimedia, Animation and Graphics:** Playing Audio, Playing Video, Rotate Animation, FadeIn/FadeOut Animation, Zoom Animation, Scale Animation, 2D and 3D Graphics.

4. **Data Storage**: Shared Preferences, Internal Storage, External Storage, SQLite Databases, Content provider and Remote Databases.

5. **Advanced Components of Android**: Web App, JSON Parsing, Google Map, GPS, Sensors, Bluetooth/Wi-Fi Connectivity.

TEXT/ REFERENCE BOOKS:

1. Jim Keogh, "J2EE- The Complete Reference", Tata McGraw-Hill, Edition (2002).

2. Herbert Schildt, “Java-The Complete Reference”, Tata McGraw-Hill, Seventh Edition (2008).
3. Neil Smyth, “Android Studio 2 Development Essentials”, Payload Media, Createspace Independent Pub (2016).
4. John Horton, “Android Programming for Beginners”, Packt Publishing Limited (2015).
5. Alur Deepak, Malks Dan and Crupi John, “Core J2EE Patterns: Best Practices and Design Strategies”, Prentice Hall India (2001).
6. Austin and Pawlan, “Advanced Programming for JAVA2 Platform”, Pearson Education (2004).
7. Geary M David, “Core JSTL Mastering the JSP standard Tag Library”, Pearson Education(2007).
8. Reto Meier, “Professional Android 4 Application Development”, Wiley (2012).
9. Greg Nudelman, “Android Design Patterns: Interaction Design Solutions for Developers”, Wiley (2013).

COURSE OUTCOMES (CO):

After learning this course students will be able to

CO1. Evaluate problems and analyse data using current technologies in a wide variety of business and organizational contexts.

CO2. Create data-driven web applications.

CO3. To create, debug and run multi-tier and enterprise - level applications.

CO4. Incorporate best practices for building applications.

CO5. Employ Integrated Development Environment (IDE) for implementing and testing of software solution

ARTICULATION MATRIX

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1	1	1					1	1	1		2	1	2
CO2	1	1		1	3			3		1	1		2	2	2
CO3	1		2		2	3		3	3	3	3	3	2	3	3
CO4	1	2	1	2	3		3		3	3	3	3	2	3	3
CO5	1	1	2			2			3	3	3	3	2	1	3

PRJ-IT413 Project -I

The batch size for carrying out project in the first semester has to be of two or three students. The student can select any topic of their interest and carry out the work in the college laboratory under the supervision of the guide allotted by the department. The work may be related to hardware or software or combinational of hardware and software but should present an innovative idea in the latest field of Information technology, Computer Science or Electronics and telecommunication.

The students have to make a write up of about 50 pages of the project they have carried out in the semester. The project report should entail the concepts learned in Software Engineering.

The work carried out by the students for a period of six months will be evaluated by a panel of two examiners appointed by the university.

SEMESTER – II (Structure - A)

Course Code	Course Title	Lectures (L)	Tutorials (T)	Practical (P)	Credits	
					Th	*Pr*
PRJ-IT408	Project – II/Internship	--	--	32	--	16
	Total	**--**	**--**	**32**	**16**	

SEMESTER – II (Structure - B)

Course Code	Course Title	Lectures (L)	Tutorials (T)	Practical (P)	Credits	
					Th	*Pr*
PRJ-IT415	Project – II/In-house	--	--	24	--	12
OEC-IT4**/OEC-**4**	Elective – V (Open Elective)	03	01	--	04	--
	Total	**03**	**01**	**24**	**16**	

*Students can undergo internship, or they can do project in-house.

Elective – V (Open Elective)	
OEC-IT416	Data Mining Data Warehouse
OEC-IT417	Artificial Intelligence
OEC-IT418	Robotics
OEC-IT419	Management Information System

PRJ-IT415: Project – II/In-house

(Total Credits: 12)

Student may complete the said project work in the the department/institute or any reputed academic/research organization. Performance of the student will be evaluated in the midterm and at the end of the semester. Students are required to prepare a complete project report duly signed by the appropriate authorities at the time of examination, where the work done by the student will be evaluated by the examiners.

OEC-IT4**/OEC-**4** Elective – V (Open Elective)

OEC-IT416 : Data Mining Data Warehouse

(Total Credits: 4, Lectures/Week: 3)

SYLLABUS:

Unit 1: Introduction Introduction to Data Mining, Importance of Data Mining, Data Mining functionalities, Classification of Data mining systems, Data mining architecture, Major Issues in Data Mining, Data mining metrics, Applications of Data Mining, Social impacts of data, Data Mining from a Database Perspective

Unit 2: Data Pre-processing Introduction,Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, DataDiscretization.

Unit 3: Classification and Prediction Basic issues regarding classification and predication, Classification by Decision Tree, Bayesian classification, classification by back propagation, Associative classification, Prediction, StatisticalBased Algorithms, Decision Tree -Based Algorithms, Neural Network -Based Algorithms, RuleBased Algorithms, Other Classification Methods, Combining Techniques, Classifier Accuracy and Error Measures

Unit 4: Clustering PEC-IT-507: Data Warehousing and Data Mining Similarity and Distance Measures, Hierarchical Algorithms, Partitioned Algorithms, Clustering Large Databases, Clustering with Categorical Attributes

Unit 5: Association Rules BasicAlgorithms, Advanced Association Rule Techniques, Measuringthe Quality ofRules

Unit 6: Applications and other Data mining techniques Data Mining Applications, Mining Event Sequences, Visual DM Text Mining, Web Mining, The WEKA data mining Workbench

REFERENCE BOOKS:

1. Data Mining: Concepts and Techniques, J. Han and M. Kamber, Morgan Kaufman, 3/E , 2011

2. Data Warehousing, Data Mining, and OLAP, Alex Berson, Stephen J. Smith,MGH, 1998.

COURSE OUTCOMES:

CO1. Store voluminous data for online processing
CO2. Pre-process the data for mining applications
CO3. Design and deploy appropriate classification techniques
CO4. Evaluate various mining techniques on complex data objects

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1		3			2									3	
CO2		3	3										3	3	
CO3		2			2								3	3	2
CO4		2											2	3	3

OEC-IT417 : Artificial Intelligence

(Total Credits: 4, Lectures/Week: 3)

COURSE OBJECTIVES:

- Expose the history and foundations of artificial intelligence.
- Showcase the complexity of working on real time problems underlying the need for intelligent approaches.
- Provide the mechanisms for simple knowledge representation and reasoning.
- Highlight the complexity in working with uncertain knowledge.

SYLLABUS:

Unit 1: History And Foundations - History – Scope – Influence from life – Impact of computing domains - Agents in environments - Knowledge representation – Dimensions of Complexity – Sample application domains – Agent structure.

Unit 2: Search - Problem solving as search – State spaces – Uninformed Search – Heuristic search – Advanced search – Constraint satisfaction - Applications.

Unit 3: Knowledge Representation And Reasoning - Foundations of knowledge representation and PEC-IT-504: Artificial Intelligence reasoning, representing and reasoning about objects, relations, events, actions, time, and space predicate logic, situation calculus, description logics, reasoning with defaults, reasoning about knowledge, sample applications.

Unit 4: Representing And Reasoning With Uncertain Knowledge - Probability, connection to logic, independence, Bayes rule, Bayesian networks, probabilistic inference, sample applications.

Unit 5: Case Study And Future Applications - Design of a game / Solution for problem in student‟s domain. Natural Language processing, Robotics, Vehicular automation – Scale, Complexity, Behaviour – Controversies.

COURSE OUTCOMES (COS):

CO1. Apply principle of AI in the design of an agent and model its actions.
CO2. Design a heuristic algorithm for search problems.
CO3. Analyze and represent the fact using logic for a given scenario.
CO4. Represent uncertainty using probabilistic models.
CO5. Develop a simple game or solution using artificial intelligence techniques.

REFERENCE BOOKS:

1. George F Luger, “Artificial Intelligence”, Pearson Education Publications
1. Elaine Rich and Knight, Artificial Intelligence, Mcgraw-Hill Publications
2. Patterson, “Introduction To Artificial Intelligence & Expert Systems”, PHI
3. Weiss.G, “Multi Agent systems- a modern approach to Distributed Artificial intelligence”, MIT Press.
4. Russell and Norvig, “Arificial Intelligence: A modern Approach”, Printice Hall.

Articulation Matrix:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3		3	3								3	2	
CO2			3	3	3									2	3
CO3	3	3		3	3								3	2	
CO4			3	3	3									2	3
CO5	3	3		3	3								3	2	

OEC-IT418 : Robotics

(Total Credits: 4, Lectures/Week: 3)

SYLLABUS:

Unit 01: Introduction, Brief History, Levels of autonomy, Terminology.

Unit 02: Kinematics, Forward and inverse kinematics, The Jacobian and singularities, Kinematic optimization, Out-of-plane manipulators and the Denavit-Hartenberg convention, Mobile robot forward kinematics

Unit 03: Dynamics of Robot Manipulators.

Unit 04: Control of Robot Manipulators. PD control, Nonlinear Control, Stability, Lyapunov's Direct Method, Adaptive Control

Unit 05: Path-Planning, Configuration space, Potential fields

Textbooks

1. Fu. K.S., Gonzalez R.C. and Lee C.S.G., Robotics: Control, Sensing, Vision and Intelligence, Tata McGraw Hill, 2008.
2. Ghosal A. Robotics: Fundamental Concepts and Analysis, Oxford University Press, 2006.
3. Craig J.J., Introduction to Robotics – Mechanics and Control, Pearson Prentice Hall, 2005.
4. Murray, Li and Sastry, A Mathematical Introduction to Robot Manipulation, CRC Press, 1994.

References:

1. Spong M.W., Hutchinson S. and Vidyasagar M., Robot Modeling and Control, John Wiley Sons & Inc., 2005.
2. Saha. S.K., Introduction to Robotics, McGraw Hill Education (India) Private Limited, 2014.

COURSE OUTCOMES (COS):

CO1. Basic robotic technologies used across various applications
CO2. Kinematics, dynamics, and control of Industrial and field/service robots
CO3. Sensing, perception, planning, and control applied to autonomous robots
CO4. Application of Artificial Intelligence, Neural Networks and Reinforcement learning in Robotics
CO5. Hardware systems and controllers used in robotics
CO6. Design of robotic systems for new applications

Articulation Matrix:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3		3	3								3	2	
CO2			3	3	3									2	3
CO3			3	3	3									2	3
CO4	3	3		3	3								3	2	
CO5			3	3	3									2	3
CO6	3	3		3	3								3	2	

OEC-IT419 : Management Information System

(Total Credits: 4, Lectures/Week: 3)

COURSE OBJECTIVES:

This course is designed to introduce students to

1. IT management practices (e.g., intelligent supply chain management, IT in business process management, etc.),
2. Data analyses in Microsoft Excel and Access,
3. Enterprise resource planning in SAP.

SYLLABUS:

UNIT – I : The meaning and use MIS, System View of Business, Process of MIS, Development of MIS within the organization, Management Process, Information Needs, System Approach in Planning Organizing and Controlling MIS.

UNIT – II: Planning, Implementation and Controlling of Management Information System.

UNIT – III: Fundamentals of Data Processing, Computer Operation of Manual Information System, Components of Computer Systems, Flow Chart, Conversion of Manual to Computer Based Systems, Computer Systems Software, Application Software, Telecommunication Modem.

UNIT – IV: Managerial Decision Making, characteristics and components of Decision Support System.

UNIT – V: System Design: System design consideration, input/output design, forms design, file organization and database, data management, file design, program design, control and security.

Textbooks:

1. Process, Systems, and Information, David M. Kroenke, ISBN: 0-13-278347-9
2. MIS Cases Decision Making with Application Software, 4th Edition, Lisa Miller (Same book used in MIS 128 course), ISBN-10 0-13-238105-2

COURSE OUTCOMES (COS):

CO1. Explain the importance of determining information system requirements for all management levels by describing the differences between various types of information systems.
CO2. Describe how information systems are developed.
CO3. Describe the computer revolution and its impact on the way business is conducted.
CO4. Use critical-thinking skills in identifying information systems problems and investigate existing literature about hardware and software solutions to problems.
CO5. Know the components and functions of computer systems, both hardware and software.
CO6. Describe the advances in networking, data communications and the Internet and how they affect the way business is conducted.
CO7. Identify which information technology tools are used to solve various business problems.
CO8. Display proficiency solving business problems using modern productivity tools (e.g., spreadsheet, database) or creating custom programs.

ARTICULATION MATRIX:

(3) High, **(2)** Medium, **(1)** Low															
PO CO	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**PSO1**	**PSO2**	**PSO3**
CO1		3					2							3	
CO2				3										3	
CO3		3	3	2									3		
CO4		3													
CO5		3		3									2	3	3
CO6				3										3	
CO7		3	3	2									3		
CO8		3													