SYLLABUS
Department of Information Technology
To be followed from Academic Year 2019-20

Program Educational Objectives (PEOs):

PEO1	To provide students strong foundation in mathematics and engineering fundamentals to have carrier in various fields of IT such as Networks and Security, Data Analysis and Management, Web Development etc.
PEO2	To imbibe in them professional and ethical responsibilities towards their profession, society and the environment as well as the respect for diversity.
PEO3	To enable graduates apply necessary techniques, Software and Hardware tools to foster innovation, invention and entrepreneurship.
PEO4	To help students acquire effective oral and written communication and lifelong learning skills to have productive careers in IT industries.
PEO5	To provide opportunity to the students to work effectively as individuals or in teams demonstrating their skills in solving IT related problems.

Program Outcomes (POs):

PO1 (a)	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and specialization to solve complex engineering problems.
PO2 (b)	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using principles of mathematics, natural and engineering sciences.
PO3 (c)	Design/development of solutions: Design and develop solutions by considering the public health and safety, cultural, societal, and environmental considerations to complex multidisciplinary engineering problems.
PO4 (d)	Conduct investigations of complex problems: Use research-based knowledge and methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5 (e)	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6 (f)	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7 (g)	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8 (h)	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9 (i)	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10 (j)	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and

	give and receive clear instructions.
PO11 (k)	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12 (l)	Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Objectives (PSOs):

PSO1	Foundation of mathematical concepts: To apply mathematical methodologies to crack the real-world problems using appropriate mathematical analysis, data structure and efficient computer algorithms.
PSO2	Knowledge of recent trends: To provide effective and efficient knowledge of recent technologies such as Artificial Intelligence, Cyber Security, Internet of Things etc.
PSO3	Project based learning: To provide platform to the students to develop a new and innovative multidisciplinary project to cater local industry needs.

Table of Correlation :

Syllabus Structure
Final Year – Department of Information Technology
Academic Year 2019-20

SEMESTER – VII

Course Code	Course Title	Lectures (L)	Tutorials (T)	Practical (P)	Credits	
					Th	***Pr***
IT-401	Cryptography and Network Security	03	--	02	03	01
IT-403	Mobile & Wireless Communication	03	--	--	03	--
IT-405	E-Commerce	03	--	02	03	01
IT-407	Introduction to Data Science	03	--	02	03	01
IT-409	Elective – III	03	--	--	03	--
IT-411	Computer Laboratory - V	02	--	02	--	01
IT-413	Project -I	--	--	06	--	03
		17	01	**16**	**15**	**07**

PCC-IT-411 - Computer Laboratory – V – In the Academic year 2019-20 - Adv. JAVA /Mobile Apps dev

Elective – III

IT409-A: Distributed Systems
IT409-B: Human Computer Interaction
IT409-C: Multimedia Systems
IT409-D: Information Theory and Coding
IT409-E: Machine Learning

SEMESTER -VIII

Course Code	Course Title	Lectures (L)	Tutorials (T)	Practical (P)	Credits	
					Th	***Pr***
IT-402	Elective – VI	03	01	--	04	--
IT-404	Elective – VII	03	01	--	04	--
IT-406	Project – II	--	--	16	--	08
	Total	**09**	**02**	**16**	**08**	**08**

Elective – VI

IT402-A: Cloud Computing
IT402-B: IOT
IT402-C: Optimization Techniques
IT402-D: Big Data Analytics

Elective – VII

IT404-A: Pattern Recognition
IT404-B: Deep Learning
IT404-C: Embedded Systems

NOTE:

Students can opt Department level open elective in semester I or Semester II which can be opted to fulfil the credit requirement of CTS and backlog students. The open elective can be opted in first or second semester. Students can go for Internship/Industry projects in second semester of final year. All those students doing internship/ industry project are required to complete 8 credits of Electives. They can either prepare on their own or can seek online guidance from the concern faculty.

Head, Dept. of IT

SEMESTER VII

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 logarithms

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

5.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

4. 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 reports 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			

IT-403: 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.

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

IT-405: E-COMMERCE

(Total Credits: 4, Lectures/Week: 3, Practical/Week: 2)

COURSE OBJECTIVES:

1. Understand concept of Ecommerce and its types.
2. Be familiarized with technologies for Ecommerce.
3. Understand different types of Online Payment systems.
4. Understand Selling and marketing on web.

COURSE CONTENTS:

1.The revolution is just beginning E-Commerce: The revolution is just beginning, Organizing Themes.

2.E-Commerce Business Models and Concepts: Business Models, B2C Business Models, B2B Business Models, Business Models in Emerging areas, how internet and web change business: strategies, structure and process.

3. Building an E-Commerce web site: A systematic approach, choosing server software, Choosing hardware, other site tools.

2.Online Security and Payment Systems E-commerce security environment, Security threats in e-commerce environment, Technology solutions, Management policies, business procedures and public laws, payment systems, e-commerce payment systems, Electronic billing presentment and payment, case study of Paypal.

3.E-Commerce Marketing Concepts Consumer online Internet audience and consumer behaviour, Basic marketing concept, Internet marketing technologies, B2C and B2B marketing and branding strategies

4. Ethical, Social and Political Issues in E-Commerce: Understanding Ethical, social and political issues in E-commerce, Privacy and information rights, Intellectual property rights, Governance, Public safety and welfare.

5.Online Retailing and Services: The retail sector, Analyzing viability of online firms, E-commerce in action: e-tailing business models, common themes in online retailing, online financial services, online travel services, online career services.

6.Social networks, Auctions and Portals: Social networks and online communities, online auctions, E-commerce portals.

TEXT/REFERENCE BOOKS:

1. Kenneth Loudon, Carol Travel, "E-Commerce, Business, Technology, Society", Pearson Education, 13/e.
2. Kalakota and Whinston "E-commerce", PHI

COURSE OUTCOMES (CO):

After learning this course students will be able to:

CO1. Demonstrate an understanding of the foundations and importance of E-commerce.
CO2. Understand the impact of Information and Communication technologies, especially of the Internet in business operations.
CO3. Comprehend risk, legal issues and privacy in E-Commerce and Assess electronic payment systems.
CO4. Analyse the critical building blocks of E-Commerce and different types of prevailing business models employed by leading industrial leaders.

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	
CO2		3												3	
CO3		2		3		1	2						2	2	2
CO4		2	3	3	3								3	2	3

IT-407: INTRODUCTION TO DATA SCIENCE

(Total Credits: 4, Lectures/Week: 3, Practical/Week: 2)

COURSE OBJECTIVES:

1. Get a crash course in Python.
2. Learn the basics of linear algebra, statistics, and probability.
3. Collect, explore, clean, manage and manipulate data.
4. Dive into the fundamentals of machine learning.
5. Implement models such as k-nearest Neighbours, Naive Bayes, linear and logistic regression, decision trees, neural networks, and clustering.
6. Explore recommender systems, natural language processing, network analysis, MapReduce, and databases.

COURSE CONTENTS:

1. Introduction: The Ascendance of Data, What Is Data Science, Motivating Hypothetical: Data Sciencester, Python the Basics, Visualizing Data with Python, matplotlib, Bar Charts, line Charts, Scatter plots.

2.Mathematics of Data Science: Linear Algebra, Vectors Matrices, Statistics, Describing a Single Set of Data, Correlation, Simpson's Paradox, some Other Correlational Caveats, Correlation and Causation, Probability, Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem, Hypothesis and Inference Statistical Hypothesis Testing, Example: Flipping a Coin, Confidence Intervals, P-hacking, Example: Running an A/B Test, Bayesian Inference, Gradient Descent, The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Putting It All Together, Stochastic Gradient Descent.

3. Working with Data in Python:
stdin and stdout, Reading Files, Scraping the Web, Using APIs, Example: Using the Twitter APIs working with Data, Exploring Your Data, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

4. Machine Learning:
Modelling, What Is Machine Learning?, Overfitting and Underfitting, Correctness, The Bias-Variance Trade-off, Feature Extraction and Selection, k-Nearest Neighbors, The Model, Example: Favourite Languages, The Curse of Dimensionality, Naive Bayes, A Really Dumb Spam Filter, A More Sophisticated Spam Filter, Implementation, Testing the Model.

5. Regression: Simple Linear Regression, The Model, Using Gradient Descent, Maximum Likelihood Estimation, Multiple Regression, The Model, Further Assumptions of the Least Squares Model, Fitting the Model, Interpreting the Model, Goodness of Fit, Digression: The Bootstrap, Standard Errors of Regression Coefficients, Regularization, Logistic Regression, The Problem, The Logistic Function, Applying the Model, Goodness of Fit, Support Vector Machines.

6. Decision Trees and Neural Networks: What Is a Decision Tree?, Entropy, The Entropy of a Partition, Creating a Decision Tree, Putting It All Together, Random Forests, Neural Networks, Perceptrons, Feed-Forward Neural Networks, Back propagation, Example: Defeating a CAPTCHA

7. Recommender Systems: Manual Curation, Recommending what's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering

TEXT/REFERENCE BOOKS:

1. James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer, 2013.
2. Han, J., Kamber, M., Pei, J. Data mining concepts and techniques. Morgan Kaufmann, 2011.
3. Hastie, T., Tibshirani, R., Friedman, J. The Elements of Statistical Learning, 2nd edition. Springer, 2009.
4. Murphy, K. Machine Learning: A Probabilistic Perspective. - MIT Press, 2012.
5. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
6. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
7. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.

COURSE OUTCOMES (CO):

After learning this course students will be able to

CO1. Know basic notions and definitions in data analysis, machine learning.
CO2. Know standard methods of data analysis and information retrieval
CO3. Be able to formulate the problem of knowledge extraction as combinations of data filtration, analysis and exploration methods.
CO4. Be able to translate a real-world problem into mathematical terms.
CO5. Possess main definitions of subject field.
CO6. Possess main software and development tools of data scientist.
CO7. Learn to develop complex analytical reasoning.

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	3	1				2			3			3	1	
CO2	1	1	1					2					1	2	3
CO3	2	1	2			3			1			3	1	2	
CO4	2	3	2			2				3			3	2	3
CO5		1	1		3				1			2	1		1
CO6	1	2					2						1		3
CO7	1	1				2	1					1	1	1	3

IT-409: ELECTIVE – III/OPEN ELECTIVE

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

IT409-A: DISTRIBUTED SYSTEMS

COURSE OBJECTIVES:

1. To learn the principles, architectures, algorithms and programming models used in distributed systems.
2. To examine state-of-the-art distributed systems, such as Google File System.
3. To design and implement sample distributed systems.

COURSE CONTENTS:

1. **Introduction:** Definition, Goals, Hardware and software concepts, Client server models.

2. **Communications:** Layered protocols, Remote procedure call, Remote Object Invocation, Message oriented communications, Stream oriented communications.

3. **Processes:** Threads, clients, Servers, Code Migrations, Software Agents.

4. **Naming:** Naming Entities, Locating Mobile entities, Removing Unreferenced entities.

5. **Synchronization:** Clock Synchronizations, Logical Clocks, Global States, election Algorithms, Mutual Exclusion, Distributed Transactions.

6. **Consistency and Replications:** Introductions, Data Centric consistency models, Client centric consistency model, Distribution Proto**cols.**

7. **Fault Tolerance:** Introduction, Process Resilience, Reliable Client-server communication, Distributed Commit, Recovery. cols,Consistency protocols.

8. **Distributed Object based systems:** CORBA, Distributed COM, GLOBE and their comparisons

9. **Distributed file systems:** Sun network file system, The coda file systems, Other file systems and their comparisons

10. **Distributed document based systems:** WWW and lotus notes and its comparison, Distributed coordinate based systems

TEXT/REFERENCE BOOKS:

1. Distributed Systems, principals and paradigms by Andrew S. Tanenbaum and Maarten van Steen
2. Distributed Systems, Concepts and Design by George Coulouris, Jean Dollimore, Tim Kindberg

COURSE OUTCOMES (CO):

After learning this course students will be able to

CO1. Students will identify the core concepts of distributed systems: the way in which several

machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
CO2. Students will examine how existing systems have applied the concepts of distributed systems in designing large systems, and will additionally apply these concepts to develop sample systems.

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	2	3								3	3	
CO2				3	3			2							3

IT409-B: HUMAN COMPUTER INTERACTION

COURSE OBJECTIVES:

1. Identify and describe various HCI methodologies, including input and interaction types
2. Articulate the co-dependency of the user and the technology in an HCI system
3. Learn and reflect on key concepts, theories, processes, and frameworks in interaction design, and apply this knowledge to an interactive design process
4. Apply some user-centred design methods to practical design problems
5. Develop basic prototypes with a range of interaction styles and technologies

COURSE CONTENTS:

1. Introduction: What is HCI, Principles of HCI, importance of HCI, Input-output channels, Human memory, thinking: Reasoning and Problem Solving, Human emotions, Individual differences.

2. Interaction style: Models of interaction, Norman's Action Model, Gulf of Execution and Evaluation, Ergonomics, Interaction styles, WIMP Interface, Interactivity, Context of interaction, User experience, Paradigms of Interactions.

3. Design rules and Guidelines: What is interaction design?, The software design process, Prototyping techniques, Wire-Framing Principal to support usability, Eight Golden Rules of Interface Design, Principles of Good Design Element of windowing system,

4. Evaluation Techniques and principal: What is evaluation, Goal of evaluation, Evaluation through expert analysis, Evaluation through user participation, choosing an Evaluation Method? Universal design principal, Multi model interaction, designing for diversity

5. HCI Models and Theories: Linguistic Models, challenge of display based system, Cognitive architectures, Communication and collaboration models, Hierarchical task analysis (HTA), Uses of task analysis, Diagrammatic dialog design notations, JDS diagrams, Dialog semantics, dialog analysis and Design

6. Documentation and Groupware: Groupware systems, computer-mediated communication, Decision support system, frame works of groupware, synchronous groupware, Ubiquitous Computing, Finding things on web Future of HCI.

TEXT/ REFERENCE BOOKS:

1. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human-Computer Interaction", Pearson Education, ISBN 81- 297-0409-9, 3rd Edition.
2. Ben Shneiderman, "Designing the User Interface", Pearson Education, ISBN 81-7808-262-4, 3rd Edition.
3. Gerard Jounghyun Kim (20 March 2015). Human–Computer Interaction: Fundamentals and Practice.

COURSE OUTCOMES:

After learning 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

IT409-C: MULTIMEDIA SYSTEMS

COURSE OBJECTIVES:

1. Learn and understand technical aspect of Multimedia Systems.
2. To learn various multimedia authoring systems.
3. To understand various networking aspects used for multimedia applications.

COURSE CONTENTS:

1. Introduction to Multimedia.

2. Multimedia Data Representation: Text, Audio and Speech, Images and Graphics, Video and Animation

3. Multimedia Data Compression: Lossless Compression Algorithms, Lossy Compression Algorithms, Image Compression Standards, Video Compression Techniques, Audio Compression Techniques

4. Multimedia Database Systems: Characteristics and Architecture of MMDBS, Logical Design, Physical Design (Storage Structure and Access methods, Indexing and clustering, etc.)

5. Multimedia Indexing and Retrieval: Computer Vision and Image Processing Techniques, Image and Video Indexing Techniques, Image and video retrieval techniques.

6. Multimedia Network Communications and Applications: Quality of Multimedia Data Transmission, multimedia over IP, Multimedia over ATM Networks, Transport of MPEG 4 ,Media – on – Demand (MOD)

TEXT/ REFERENCE BOOKS:

1. Ze-Nian Li and Mark Drew, "Fundamental of Multimedia" Prentice Hall, 2004.
2. Fred Halsall, "Multimedia Communication Applications, Networks, Protocols and Standards" Pearson Education-2003.
3. P. Apers, H. Blanken and M. Houtsma (Eds) Springer Verlag, "Multimedia Databases in Perspective" 1998.

COURSE OUTCOMES (CO):

After learning this course students will be able to

CO1. Develop understanding of technical aspect of Multimedia Systems.
CO2. Understand various file formats for audio, video and text media
CO3. Develop various Multimedia Systems applicable in real time.
CO4. Design interactive multimedia software.
CO5. Apply various networking protocols for multimedia applications.
CO6. Evaluate multimedia application for its optimum performance.

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		2													
CO2		3												3	
CO3		2	3	2										2	3
CO4			3										1		3
CO5	3				3								3		
CO6	3														

IT409-D: INFORMATION THEORY AND CODING

COURSE OBJECTIVES:

1. To introduce information theory, the fundamentals of error control coding techniques and their applications, and basic cryptography.
2. This class will first introduce the basic concepts of information theory, leading to the channel capacity theorem.
3. Afterwards, the course will consider error control coding techniques and applications. Finally, the basic concepts of cryptography will be introduced.

COURSE CONTENTS:

1.Uncertainty, Information and Entropy Information Measures: Characteristics on information measure; Shannon's concept of information; Shannon's measure of information; Model for source coding theorem; Communication system; Source coding and line/channel coding; channel mutual information capacity (Bandwidth);

2.Channel coding, Theorem for discrete memory less channel, Information capacity theorem: Error detecting and error correcting codes; Types of codes; Block codes; Tree codes; Hamming codes; Description of linear block codes by matrices; Description of linear tree code by matrices; Parity check codes; Parity check polynomials;

3. **Compression: Lossless and lossy; Huffman codes; Binary Image compression schemes; Run –**length Encoding; CCITT group-3 1D compression; CCITT group-3 2D compression; CCITT group-4 2D compression;

4. Video Image Compression: Requirement of full motion video compression; CCITT H 261 video coding algorithm; MPEG compression methodology; MPEG-2 compression; Audio (Speech) compression;

5. Cryptography: Encryption; Decryption; Cryptogram (cipher text); Concept of cipher; Cryptanalysis; Keys: Single key (Secret key); Cryptography; two-key (Public key) cryptography; Single key cryptography; Ciphers; Block Cipher code; Stream ciphers; Requirements for secrecy; The data Encryption Standard; Public Key Cryptography; Diffie-Hellmann public key distribution; The Rivest- Shamin Adelman(R-S-A) system for public key cryptography; Digital Signature;

TEXT/REFERENCE BOOKS:

1. Jorge Castiñeira Moreira, Patrick Guy Farrell , Essentials of Error-Control Coding
2. John Wiley, 2006. ISBN: 978-0-470-02920-6
3. Dominic Welsh, Codes and Cryptography, Oxford Science Publications, 1988.

COURSE OUTCOMES (CO):

After learning 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, and automatic 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

IT409-E: MACHINE LEARNING

COURSE OBJECTIVES:

1. To introduce students to the basic concepts and techniques of Machine Learning.
2. To become familiar with regression methods, classification methods, clustering methods.
3. To become familiar with Dimensionality reduction Techniques.

COURSE CONTENTS:

1. Introduction: overview of machine learning, related areas, applications, software tools, course objectives.

2. Parametric regression: linear regression, polynomial regression, locally weighted regression, numerical optimization, gradient descent, kernel methods.

3.Generative learning: Gaussian parameter estimation, maximum likelihood estimation, MAP estimation, Bayesian estimation, bias and variance of estimators, missing and noisy features, nonparametric density estimation, Gaussian discriminant analysis, naive Bayes.

4. Discriminative learning: linear discrimination, logistic regression, logit and logistic functions, generalized linear models, softmax regression.

5. Neural networks: the perceptron algorithm, multilayer perceptrons, backpropagation, nonlinear regression, multiclass discrimination, training procedures, localized network structure, dimensionality reduction interpretation.

6. Support vector machines: functional and geometric margins, optimum margin classifier, constrained optimization, Lagrange multipliers, primal/dual problems, KKT conditions, dual of the optimum margin classifier, soft margins, kernels, quadratic programming, SMO algorithm.

7. Graphical and sequential models: Bayesian networks, conditional independence, Markov random fields, inference in graphical models, belief propagation, Markov models, hidden Markov models, decoding states from observations, learning HMM parameters.

8. Unsupervised learning: K-means clustering, expectation maximization, Gaussian mixture density estimation, mixture of naive Bayes, model selection.

9. Dimensionality reduction: feature selection, principal component analysis, linear discriminant analysis, factor analysis, independent component analysis, multidimensional scaling, manifold learning.

TEXT/REFERNCE BOOKS:

1. Elements of Statistical Learning, T. Hastie, R. Tibshirani and J. Friedman, Springer, 2001.
2. Machine Learning, E. Alpaydin, MIT Press, 2010.
3. Pattern Recognition and Machine Learning, C. Bishop, Springer, 2006.
4. Machine Learning: A Probabilistic Perspective, K. Murphy, MIT Press, 2012.
5. Pattern Classification, R. Duda, E. Hart, and D. Stork, Wiley-Interscience, 2000.
6. Machine Learning, T. Mitchell, McGraw-Hill, 1997.

COURSE OUTCOMES:

After learning this course students will be able to:

CO1. Gain knowledge about basic concepts of Machine Learning
CO2. Identify machine learning techniques suitable for a given problem.
CO3. Solve the problems using various machine learning techniques.
CO4. Apply Dimensionality reduction techniques.
CO5. Design application using machine learning techniques.

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	
CO2		3												3	
CO3			3	2	3										3
CO4					3								3		
CO5			3	2											3

IT-411: COMPUTER LABORATORY-V (Adv. JAVA/Mobile Apps Dev)

(Total Credits: 1, Lectures/Week: 2, Practical/Week: 2)

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:

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

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).

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

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

GUI in JAVA: AWT, Applet, Swing.

MOBILE APPLICATION DEVELOPMENT:

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.

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.

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

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

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

IT-413: PROJECT I

(Total Credits: 3)

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 –VIII

IT-402: ELECTIVE – VI

(Total Credits: 4, Lectures/Week: 3,Tutorial:1)

IT402-A: Cloud Computing

COURSE OBJECTIVES:

1. To learn how to use Cloud Services.
2. To implement Virtualization
3. To implement Task Scheduling algorithms.
4. Apply Map-Reduce concept to applications.
5. To build Private Cloud.
6. Broadly educate to know the impact of engineering on legal and societal issues involved.

COURSE CONTENTS:

1.Introduction, Cloud Infrastructure: Network centric computing and network centric content, Peer-to-peer systems, Cloud Computing: an old idea whose time has come, Cloud Computing delivery models & Services, Ethical issues, Cloud vulnerabilities, Challenges, Cloud Infrastructure: Amazon, Google, Azure & online services, open source private clouds. Storage diversity and vendor lockin, intercloud, Energy use & ecological impact of data centers, service level and compliance level agreement, Responsibility sharing, user experience, Software licensing.
2.Cloud Computing: Application Paradigms.: Challenges, existing and new application opportunities, Architectural styles of cloud applications: single , multi ,hybrid cloud site, redundant, non redundant , 3 tier, multi tier architectures, Workflows coordination of multiple activities, Coordination based on a state machine model -the Zoo Keeper, The Map Reduce programming model, Apache Hadoop, A case study: the GrepTheWeb application, Applications: Healthcare, Energy systems, transportation, manufacturing, Education, Government, mobile communication, application development.
3.Cloud Resource Virtualization: Definition, merits and demerits, types & Techniques, Layering, Virtual machine monitors, Hardware support for virtualization Case study: Xen -a VMM based on paravirtualization, Optimization of network virtualization in Xen 2.0, vBlades -paravirtualization targeting a x86-64 Itanium processor, A performance comparison of virtual machines, The darker side of virtualization, Software fault isolation.
4.Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Applications of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based web services, Resource bundling, combinatorial auctions, fair queuing, Start time fair queuing, borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling mapreduce applications subject to deadlines, Resource management and application scaling
5.Cloud Security, Cloud Application Development: Storage systems: Evolution, Storage models, file systems, databases, DFS, General parallel File system, GFS, Hadoop, Locks & Chubby, TPS, NOSQL, Big Table, Mega store. Cloud security: Risks, Security, privacy, Trust. Security of OS, VM, VMM, shared image, management OS, Xoar.

TEXT/ REFERENCE BOOKS:

1. Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, 1st edition, 2014, Morgan Kaufmann Publishers, Inc., San Francisco. ISBN-13:

978-0124166752, ISBN-10: 012416675X
2. T. Erl, R. Puttini, and Z. Mahmood, Cloud Computing: Concepts, Technology & Architecture
3. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.
4. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things, Kai Hwang, Jack Dongarra and Geoffrey Fox, Morgan Kaufmann, 20111.
5. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw Fill, 2010

COURSE OUTCOMES (CO):

CO1: Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.
CO2: Design different workflows according to requirements and apply map reduce programming model.
CO3: Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
CO4: Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds
CO5: Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application
CO6: Broadly educate to know the impact of engineering on legal and societal issues involved in addressing the security issues of cloud computing.

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		
CO2			3												3
CO3	3													3	
CO4			3											3	
CO5				3											
CO6						3									

IT402-B: IOT

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):

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

IT402-C: 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):

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

IT402-D: Big Data Analytics

COURSE OBJECTIVES:

1. Understand the Big Data Platform and its Use cases
2. Provide an overview of Apache Hadoop
3. Provide HDFS Concepts and Interfacing with HDFS
4. Understand Map Reduce Jobs
5. Provide hands on Hodoop Eco System
6. Apply analytics on Structured, Unstructured Data.
7. Exposure to Data Analytics with R.

COURSE CONTENTS:

UNIT I : INTRODUCTION TO BIG DATA AND HADOOP Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.
UNIT II : HDFS(Hadoop Distributed File System) The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.
UNIT III : Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.
Unit IV : Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction
UNIT V : Data Analytics with R Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

TEXT/ REFERENCE BOOKS:

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

COURSE OUTCOMES:

CO1. Identify Big Data and its Business Implications.
CO2. List the components of Hadoop and Hadoop Eco-System.
CO3. Access and Process the Data on Distributed File System.
CO4. Manage Job Execution in Hadoop Environment.
CO5. Develop Big Data Solutions using Hadoop Eco System.

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		2							3	3	
CO2	2			3									3	3	
CO3			3		3										2
CO4					2									3	2
CO5					3										3

IT-404: ELECTIVE – VII

(Total Credits: 4, Lectures/Week: 3,Tutorial:1)

IT404-A: 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 to patterns and pattern recognition application development

2. Supervised pattern detection I (Bayes classifiers)

3. Feature extraction - multivariate data

4. Feature extraction - image data

5. Supervised pattern detection II (linear classifiers)

6. Unsupervised pattern detection I (clustering)

7. Supervised pattern detection III (non-linear classifiers, neural networks, support vector machines)

8. Supervised pattern detection IV (rule-based classifiers)

9. Unsupervised pattern detection II (self-organization, competitive learning)

10. Deep learning, convolutional neural networks

11. 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):

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

IT404-B: 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):

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

IT-404-C: Embedded Systems

COURSE OBJECTIVES:

1. To introduce students to the modern embedded systems and to show how to understand and program such systems using a concrete platform built around
2. A modern embedded processor like the Intel ATOM.

COURSE CONTENTS:

1. Introduction to Embedded systems: Embedded system vs general Computing system, Classification of Embedded system, Core of Embedded system, RISC vs CISC controllers, Harvard vs Van Neumen architecture.
2. IA 32: Block diagram description and functions of each unit, Atom processor-Addressing modes, Registers, Memory accesses, memory map, Instruction set, Segmentation
3. Task switching: Paging, Hyper-threading, Caches and TLB, Execution pipeline, Interrupts, Software optimization, VT. FSB Architecture. Chipset over view, BIOS Configuration and responsibilities, BOOT up sequence.
4. Operating system overview: Operating system concepts, Processes and Tasks and Threads, Scheduling. Memory allocation, Clocks and timers. Inter task synchronization, Device driver models, Bus drivers, Power management, Examples and overview of Real time OS

TEXT/ REFERENCE BOOKS:

1. Raj Kamal, Embedded Systems Architecture, Programming, and Design. (2/e), Tata McGraw Hill, 2008.
2. K.V. Shibu, Introduction To Embedded Systems, Tata McGraw, 2009.
3. Peter Barry and Patric Crowley, Intel architecture for Embedded system .

COURSE OUTCOMES (CO):

CO1: Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems..

CO2: Become aware of the architecture of the ATOM processor and its programming aspects (assembly Level)

CO3: Become aware of interrupts, hyper threading and software optimization.

CO4: Design real time embedded systems using the concepts of RTOS.

CO5: Analyze various examples of embedded systems based on ATOM processor.

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	
CO2	3			3										3	
CO3	3		3										3		
CO4		3	3											2	3
CO5		3													2

IT-406: PROJECT-II

(Total Credits: 8)

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. 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.

Those students who had gone for the industrial training or reputed certificate course or any summer internship, all such student must submit their report/certificate to the department. The department will evaluate their report and all such students will get the credits as mentioned in the scheme.