Swami Ramanand Teerth Marathwada University, Nanded

Teaching and Evaluation Scheme for

Final Year Program in Information Technology (CGPA)

Semester VII

Effective from 2017-2018

Course Code	Course	Teaching Scheme			Credits		
		L	T	P	T	P	Total
IT401	Information and Network Security	04	-	02	04	01	05
IT 402	Data Mining & Data Warehouse	04	-	02	04	01	05
IT 40*	Elective –III	04	-	02	04	01	05
IT 40*	Elective –IV	04	-	-	03	-	03
IT 411	Application Development Lab using Android	02	-	02	-	02	02
IT 412	Industrial Internship / Certified Course /Technical Training	-	-	-	-	01	01
IT 413	Project-I	-	-	04	-	03	03
Total		18	-	12	15	09	24

Code 40* Elective III		Code40* Elective IV	
IT 403	Embedded Systems	IT 407	Software Testing and Quality Assurance
IT 404	Digital Image Processing	IT 408	Unified Modeling Language
IT 405	Perl Programming	IT 409	Mobile Application Development
IT 406	Green IT- Principles and Practices	IT 410	Management Information System

Total Credits: 24

Contact Hours/Week: 30

Evaluation Scheme					
Theory Credit Course		Theory Audit Course		Practical / Workshop	
MSE	ESE	MSE	ESE	Continuous Evaluation	ESE
20 M	80 M	20 M	80 M	30 M	70 M
Minimum for Passing in Theory, Audit and Practical / Workshop : 40 Each					

Swami Ramanand Teerth Marathwada University, Nanded

Teaching and Evaluation Scheme for

Final Year Program in Information Technology (CGPA)

Semester VIII

Effective from 2017-2018

Course Code	Course	Teaching Scheme			Credits		
		L	T	P	T	P	Total
IT 414	Mobile Communication	04	-	02	04	01	05
IT 415	Information Tech. Project Mgmt.	04	-	-	04	-	04
IT 41*	Elective V	04	-	02	04	01	05
IT 41*	Elective VI	04	-	02	03	01	04
IT 424	Web Technology Lab III	02	-	02	-	02	02
IT 425	Project-II	-	-	04	-	04	04
Total		18	-	12	15	09	24

Code41* Elective V		Code41* Elective VI	
IT 416	Cloud Computing	IT 420	Cyber Security
IT 417	Distributed Systems	IT 421	E-Commerce
IT 418	Internet of Things	IT 422	Wireless Sensor Networks
IT 419	Advanced Computer Architecture	IT 423	Big Data Analytics

Total Credits: 24

Total Contact Hours/Week: 30

Evaluation Scheme					
Theory Credit Course		Theory Audit Course		Practical / Workshop	
MSE	ESE	MSE	ESE	Continuous Evaluation	ESE
20 M	80 M	20 M	80 M	30 M	70 M
Minimum for Passing in Theory, Audit and Practical / Workshop : 40 Each					

Swami Ramanand Teerth Marathwada University, Nanded

Final Year U.G. Program in Information Technology (CGPA)

Effective from 2017-18

IT401: INFORMATION AND NETWORK SECURITY

Teaching Scheme **L: 4 T: 0**

Evaluation Scheme	MSE	ESE	Minimum Passing Marks
	20 Marks	80 Marks	40%

Course Objectives:

1. To understand the principle of encryption algorithms, conventional and public key cryptography.
2. To have detailed knowledge about authentication, hash functions and application level security mechanisms.
3. To know the network security tools and applications and to understand the system level security used.

Course Contents:

Unit-I: Introduction **(6Hrs)**

Overview: Computer security concepts, security attacks, security services, security mechanism, a model for network security.

Classical Encryption Technique: Symmetric cipher model, Substitution techniques,Transposition techniques.

Unit-II: Block Cipher **(7 Hrs)**

Block Cipher Principles, Data Encryption Standard (DES). A DES example.

Advanced Encryption Standard: Finite Field Arithmetic, AES

Unit-III: Block Cipher Operation **(7Hrs)**

Multiple Encryption and Triple DES,Electronic Code block, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode.

Stream Cipher: Principles of Pseudorandom Number Generation,Pseudorandom Number Generators,Pseudorandom Number Generation Using a Block Cipher, Stream Ciphers,RC4.

Unit-IV: Public Key Cryptography **(6 Hrs)**

Principles of Public Key Cryptosystems, The RSA algorithm, Other Public-Key Cryptosystems, ELGAMAL Cryptosystems, Diffie-Hellman Key Exchange.

Cryptographic Hash Functions: Secure Hash Functions (SHA -512).

Unit-V: Message Authentication Codes **(7 Hrs)**

Message Authentication Requirements, Message Authentication Functions,Requirements for Message Authentication Codes,Security of MACs,MACs Based On Hash Functions:HMAC

Digital Signatures: Digital Signature Standard (DSS).

Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption,Distribution of Public Keys.

Unit-VI: Network and Internet Security **(7 Hrs)**

Transport-Level Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security,Transport Layer Security,HTTPS.

Electronic Mail security: Pretty Good Privacy (PGP).

IP security: IP Security Overview, IP Security Policy, Encapsulating Security Payload.

Outcomes:

After completion of this course the student will be able to:

1. Understand the principle of encryption algorithms; conventional and public key cryptography.
2. Have detailed knowledge about authentication, hash functions and application level security mechanisms.
3. Know the network security tools and applications and to understand the system level security used.

Text Books:

1. "*Cryptography and Network Security*" by William Stallings 5th Edition, Pearson Education ISBN 13: 978-0-13-609704-4.

Reference Books:

1. "*Cryptography and Network Security*" by Behrouz A. Forouzan, McGraw Hill.ISBN- 13: 978-00-728-7022-0.

Swami Ramanand Teerth Marathwada University, Nanded

Final Year U.G. Program in Information Technology (CGPA)

Effective from 2017-18

IT401: INFORMATION AND NETWORK SECURITY LAB

Teaching Scheme **P: 2**

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor will frame 8 programming assignments based on the suggested list of assignments.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practical assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments / Programs.

1. Write a program that can encrypt and decrypt using the general Caesar cipher,
2. Write a program that can encrypt and decrypt using Hill cipher.
3. Write a program for letter frequency attack
4. Write a program to implement DES.
5. Implement a program to AES.
6. Implement Random Number Generation.
7. Implement RSA Algorithm.
8. Implement ELGAMAL Algorithm.
9. Implement RC4 Algorithm.
10. Implement SHA-512 Algorithm.

Practical Examination:

Practical examination will be of 3 hours and it includes performance and viva-voce examination based on the term work.

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Final Year U.G. Program in Information Technology (CGPA)

Effective from 2017-18

IT 402. DATA MINING & DATA WAREHOUSING

Teaching Scheme **L:4**

Evaluation Scheme	MSE	ESE	Minimum Passing Marks
	20 Marks	80 Marks	40%

Course Objectives:

1. To introduce the basic concepts of Data Warehouse and Data Mining techniques.
2. To examine the types of the data to be mined and apply pre-processing methods on raw data.
3. To learn the designing of Data Warehousing schema for applications.
4. To discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
5. To understand various tools of Data Mining and their techniques to solve the real time problems.
6. To develop ability to design various algorithms based on data mining tools.

Course Contents:

Unit I **(6 Hrs)**

Why Data mining? What is Data Mining? Kinds of Data, Kinds of Patterns to Be Mined, Technologies used, Targeted Applications, Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Description of Data, Data Matrix Versus Dissimilarity Matrix, Proximity Measures for Nominal Attributes, Proximity Measures for Binary Attributes, Dissimilarity of Numeric Data: Minkowski Distance, Proximity Measures for Ordinal Attributes.

Unit II **(7 Hrs)**

Data Preprocessing: Data Quality: Why Preprocess the Data, Major Tasks in Data Preprocessing. Data Cleaning: Missing Values, Noisy Data, Data Cleaning as a Process. Data Integration: Entity Identification Problem, Redundancy and Correlation Analysis, Tuple Duplication, Data Value Conflict Detection and Resolution. Data Reduction: Overview of Data Reduction Strategies. Data Transformation and Data Discretization: Data Transformation Strategies, Data Transformation by Normalization, Discretization by Bining.

Unit III **(6 Hrs)**

Data Warehouse: Basic Concepts, What is a Data Warehouse, Differences between Operational Database Systems and Data Warehouses, Why Have a Separate Data Warehouse. Data Warehousing: A Multitiered Architecture. Data Warehouse Models. Extraction, Transformation, and Loading, Metadata Repository. Data Cube, Stars, Snowflakes, and Fact Constellation Schemas. Dimensions: The Role of Concept Hierarchies. Measures: Their Categorization and Computation, OLAP

Operations, A Starnet Query Model. Indexing OLAP Data: Bitmap Index, OLAP Server Architectures: ROLAP versus MOLAP versus HOLAP.

Unit IV **(7 Hrs)**

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods, Basic Concepts, Market Basket Analysis: A Motivating Example, Frequent Itemsets, Closed Itemsets, and Association Rules, Frequent Itemset Mining Methods: Apriori Algorithm- Finding Frequent Itemsets by Confined Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori, A Pattern Growth Approach for Mining Frequent Itemsets, Pattern Evaluation Methods.

Unit V **(8 Hrs)**

Classification: Basic Concepts, What is Classification, General Approach to Classification, Decision Tree Induction, Attribute Selection Measure: Information Gain, Bayes Classification Methods: Bayes Theorem, Naïve Bayesian Classification. Using IF-THEN Rules for Classification, Rule Extraction from a Decision Tree, Rule Induction Using a Sequential Covering Algorithm-Basic sequential covering algorithm, Metrics for Evaluating Classifier Performance. **Cluster Analysis:** Basic Concepts and Methods, Cluster Analysis, What is Cluster Analysis, Requirement for Cluster Analysis, Overview of Basic Clustering Methods, k-Means: A Centroid-Based Technique, The k-means partitioning algorithm.

Unit VI **(6 Hrs)**

Web Data Mining: Introduction, web terminology and characteristics, locality and hierarchy in the web, web content mining, web usage mining, web structure mining. Search Engine-introduction, characteristics of search engines, search engine functionality, search engine architecture, ranking of web pages.

Outcomes:

Students who complete this course should be able to

1. Design schema for real time data warehousing applications.
2. Process raw data to make it suitable for various data mining algorithms.
3. Discover and measure interesting patterns from different kinds of databases.
4. Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.
5. Use various data mining tools such as weka, etc.

Text Books:

1. "*Data Mining: Concepts and Techniques*", Han J & Kamber M, Third Edition, Elsevier (Morgan Kaufmann) ISBN-10: 9380931913, ISBN-13: 978-9380931913.
2. "*Introduction to Data Mining with Case Studies*" by G K Gupta, Second edition,PHI, ISBN-978-81-203-4326-9.

Reference Books:

1. "*The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling*"**,** by Margy Ross Ralph Kimball, Third Edition, Wiley Publications, ISBN-10: 8126544279, ISBN-13: 978-8126544271.
2. *"Introduction to Data Mining"* by Pang - Ning Tan, Ist Edition, Pearson Education, ISBN-10: 9332518653 , ISBN-13: 978-9332518650.
3. "*Data Mining: Next Generation Challenges and Future Directions"*, by Kargupta, Joshi,etc., Prentice Hall of India Pvt Ltd,. ISBN-10: 8120327942 , ISBN-13: 978-8120327948

Swami Ramanand Teerth Marathwada University, Nanded

Final Year U.G. Program in Information Technology (CGPA)

Effective from 2017-18

IT 402. DATA MINING & DATA WAREHOUSING LAB

Teaching Scheme **P: 2**

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor will frame 8 Programs/Assignments based on the suggested list of experiments.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practical assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments / Programs.

1. One case study given to a group of 2/3 students of a data mart/data warehouse.
   a. Write detail statement problem and creation of dimensional modeling (Creation star and snowflake schema)
   b. Implementation of all dimension table and fact table.
   c. Implementation of OLAP operations.
2. Implementation of classifier like Decision Tree, Naïve Bayes, Random Forest using any programming language such as C, C++, Java, Python,etc.
3. Use WEKA to implement Decision tree, Naïve Bayes, Random forest.
4. Implementation of clustering algorithm like K-Means, K- Medoids, using any programming language like Java, C, C++, Python, etc.
5. Use WEKA to implement the following clustering algorithms –K-Means.
6. Implementation of Association Mining like Apriori, FPM using language like Java, C, C++, Python,etc.
7. Use WEKA to implement Association Mining like Apriori, FPM.
8. Use R tool to implement Clustering/Association/ Classification Algorithms.
9. Detailed study of any one BI tool like Oracle BI, SPSS, Clementine, and XLMiner, etc.(paper Assignment).
10. Implement bit map indexes.

Practical Examination: Practical examination will be of 3 hours and it includes performance and viva-voce examination based on the term work.

Swami Ramanand Teerth Marathwada University, Nanded

Final Year U.G. Program in Information Technology (CGPA)

Effective from 2017-18

IT 403. ELECTIVE III
EMBEDDED SYSTEM

Teaching Scheme **L:4**

Evaluation Scheme	MSE	ESE	Minimum Passing Marks
	20 Marks	80 Marks	40%

Course Objectives:

1. Understanding embedded system, processor & distributed embedded systems architecture.
2. The goal of this course is to learn ARM7TDMI processor and its internal functioning.
3. Provide an in-depth understanding of the system control and peripherals communication.
4. To get familiar with features of raspberry pi.

Course Contents:

Unit I **(6 Hrs)**

Introduction-Embedded system overview, design challenge, processor technology, IC technology, design technology, Custom single processor technology Hardware- combinational logic, sequential logic, custom single purpose processor design, RT-level custom single purpose processor design, optimizing custom single purpose processors.

Unit II **(6 Hrs)**

General purpose processor Software- basic architecture, operation, programmers view, development environment, application specific instruction set processor, selecting a microprocessor, general purpose processor design. Introduction, ARM7TDMI-S processor, Block diagram, Memory mapping, Memory accelerator module.

Unit III **(8 Hrs)**

System control - Pin description, Register description, Crystal oscillator, External interrupt inputs, Other system controls, Memory mapping control, Phase Locked Loop, Power control, Reset, APB divider, Wakeup timer. GPIO - GPIO register map, Timer - TIMER/COUNTER0 and TIMER/COUNTER1 register map, Example timer operation, Architecture.

Unit IV **(8 Hrs)**

UART- UART0/1 - UART0/1 register map, UART0/1 baud rate, UART0/1 auto-baud, UART0/1 block diagram. Serial Peripheral Interface - SPI data transfers, SPI pin description, SPI register map, SPI block diagram. I2C-bus interface - I2C bus configuration, I2C operating modes, I2C Bus serial interface block diagram, Summary of I2C registers.

Unit V **(6 Hrs)**

Meet the raspberry pi, Install on operating system, Configure raspbian, Configure the firmware, Build kiosk system with pi. Thinker with GPIO pins, working with digital and analog sensors.

Unit VI **(6 Hrs)**

Get started with electronics and GPIO zero, Control LEDs with GPIO zero, add user input with a push button, make a push button music box, measure CPU usage with RGB LEDs, make a motion sensor alarm, make a range finder, make a laser TRIPWIRE, build an internet radio, Build a GPIO zero ROBOT.

Outcomes:

1. Understand the embedded system with Processors and IC technologies.
2. Understand ARM7TDMI, its registers and their internal functions.
3. Good understanding and issues to be handled in using any processor, software tools chain for embedded software solution development.
4. Understand interactive interface with pi and peripheral devices.
5. Understand peripherals with hands-on circuits and python programming.

Text Books:

1. *"Embedded System* Design- *A Unified system Hardwar/Software Introduction"* by Frank Vahid (3rd Edition, John Wiley India) ISBN 978-81-265-0837-2.
2. LPC 214x User manual (UM10139) www.nxp.com.
3. *"Raspberry Pi: A Quick-Start Guide"* by Maik Schmidt (2nd Edition, the Pragmatic Bookshelf) ISBN-13: 978-1-93778-580-2.
4. *"Simple Electronics with GPIO zero- Take the Control of Real World with your Raspberry Pi"* by Phil King (raspberrypi.org/magpi).

Reference Books:

1. LPC 17xx User manual (UM10360) :- www.nxp.com
2. ARM architecture reference manual : - www.arm.com
3. *"An Engineer's Introduction to the LPC2100 series"* by Trevor Martin (Hitex (UK) Ltd.)
4. *"ARM System Developer's Guide – Designing and Optimizing System Software"* by Andrew N. Sloss, Dominic Symes and Chris Wright (ELSEVIER) ISBN: 1-55860-874-5.
5. "*ARM System-on-Chip Architecture*" by Steve Furber (2nd Edition, Addison-Wesley Professional) ISBN-13: 9780201403527

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Final Year U.G. Program in Information Technology (CGPA)

Effective from 2017-18

IT 403. ELECTIVE III
EMBEDDED SYSTEM LAB

Teaching Scheme **P: 2**

Evaluation Scheme	**Continuous Evaluation**	**ESE**	**Minimum Passing Marks**
	30 Marks	**70 Marks**	**40%**

Term Work:

1. Instructor will frame 10 assignments based on the suggested list.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 10 practical assignments.

The assessment will be based on the following

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments/Programs.

Any five interfacing programs in embedded C based on ARM7 family members such as LPC21xx using Keil and development board.

1) 8 Bit LED and Switch Interface.
2) 7 Segment display interface.
3) Time delay program using built in Timer / Counter feature.
4) Displaying a message in a 2 line x 16 Characters LCD display.
5) I2C Interface – 7 Segment display / EPROM.
6) Interface with UART.
7) Interface with SPI.
8) Serial communication.

Any five interfacing python programs based on any Raspberry Pi board.

1) Interface with LED control ON_OFF.

2) Interface with passive infrared sensor.
3) Interface with temperature sensor.
4) Interface with push button / Interface push button to make sound box.
5) Interface a circuit to measure CPU usage with RGB LEDs.
6) Interface a circuit to make motion sensor alarm.
7) Interface a circuit make a range finder.
8) Interface a circuit to take photos from camera.

Practical Examination: Practical examination will be of three hours that includes performance and oral based on syllabus.

Swami Ramanand Teerth Marathwada University, Nanded

Final Year U.G. Program in Information Technology (CGPA)

Effective from 2017-18

IT 404. ELECTIVE-III
DIGITAL IMAGE PROCESSING

Teaching Scheme **L:4**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:
The student should be made to:

1. Learn digital image fundamentals.
2. Be exposed to simple image processing techniques.
3. Be familiar with image compression and segmentation techniques.

Course Contents:

Unit I Digital Image Fundamentals **8 Hrs**
Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models.

Unit II Image Enhancement **8 Hrs**
Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – **Frequency Domain:** Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

Unit III Image Restoration And Segmentation **10 Hrs**
Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering **Segmentation:** Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.

Unit IV Wavelets And Image Compression **6 Hrs**
Wavelets – Subband coding - Multiresolution expansions - **Compression:** Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding –Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

Unit V Image Representation And Recognition **8 Hrs**
Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments –Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors –Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Outcomes:

1. Discuss digital image fundamentals.
2. Apply image enhancement and restoration techniques.
3. Use image compression and segmentation Techniques.

Text Book:

1. *"Digital Image Processing"*, by Rafael C. Gonzales Third Edition, Richard E. Woods, , Pearson Education, 2010. ISBN-10: 9332518467, ISBN-13: 978-9332518469

References:

1. "*Digital Image Processing Using MATLAB"*Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Third Edition Tata McGraw Hill Pvt. Ltd., 2011. ISBN-10: 0070702624, ISBN-13: 978-0070702622.

2. "*Fundamentals of Digital Image Processing"* by Anil Jain K., PHI Learning Pvt. Ltd., 2011. ISBN-10: 933255191X, ISBN-13: 978-9332551916.

3. *"Digital Image Processing"*, by Willliam K Pratt John Willey, 2002. ISBN-13: 978-0471767770 , ISBN-10: 0471767778.

4. *"Digital Image Processing and Pattern Recognition"*, by Malay K. Pakhira, First Edition, PHI Learning Pvt. Ltd., 2011. ISBN-13: 978-8120340916.

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Final Year U.G. Program in Information Technology (CGPA)

Effective from 2017-18

IT 404. ELECTIVE-III
DIGITAL IMAGE PROCESSING LAB

Teaching Scheme **P: 2**

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor will frame 8 Programs/Assignments based on the suggested list of experiments.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practical assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments / Programs.

1. Display of Grayscale Images.
2. Histogram Equalization.
3. Non-linear Filtering.
4. Edge detection using Operators.
5. 2-D DFT and DCT.
6. Filtering in frequency domain.
7. Display of color images.
8. Conversion between color spaces.
9. DWT of images.
10. Segmentation using watershed transform.

Practical Examination: Practical examination will be of 3 hours and it includes performance and viva-voce examination based on the term work.

Swami Ramanand Teerth Marathwada University, Nanded

Final Year U.G. Program in Information Technology (CGPA)

Effective from 2017-18

IT 405. ELECTIVE-III
PERL PROGRAMMING

Teaching Scheme **L:4**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

This course is designed to provide

1. Basic introduction to programming using Perl.
2. Knowledge of CGI scripts.
3. Basic Object Oriented Concepts and database connectivity in Perl.

Course Contents:

Unit I **(8 Hrs)**

First Steps in Perl:

Programming Languages, Interpreted vs. Compiled Source Code, Libraries, Modules and Packages, Why is Perl Such A Great Language? It's Really Easy, Flexibility Is Our Watchword, Perl on the Web, The Open Source Effort, Developers Releases and Topaz, Our First Perl Program, Program Structure, Documenting Your Programs, Keywords, Statements and Statement Blocks, ASCII and Unicode, Escape Sequences, White Space, Number Systems, The Perl Debugger.

Working with Simple Values:

Types of Data, Numbers, Binary, Hexadecimal and Octal Numbers, Strings, Single- vs Double-quoted strings, Alternative Delimiters, Here-Documents, Converting between Numbers and Strings, Operators, Numeric Operators, Arithmetic Operators, Bitwise Operators, Truth and Falsehood , Boolean Operators , String Operators, String Comparison, Operators To Be Seen Later, Operator Precedence, Variables ,Modifying A Variable ,Operating and Assigning at Once, Autoincrement and Autodecrement, Scoping, How It Works, Variable Names, Multiple Assignments, Variable Interpolation, Currency Converter, Introducing <STDIN>.

Unit II **(6 Hrs)**

Lists ,Array and Hashes:

List: Simple Lists, Accessing List Values, List Slices, Ranges, Combining Ranges and Slices,
Arrays: Assigning Arrays, Accessing an Array, Accessing Multiple Elements, Running through **Arrays**: Array Functions

Hashes: Creating a Hash, Working with Hash Values, Adding, Changing, and Taking Values Away from a Hash, Accessing Multiple Values.

Loops and Decisions:

Deciding If..., 1, 2, Skip A Few, 99, 100, Looping While..., Controlling Loop Flow.

Regular Expressions:

What Are They?, Working with Regular Expressions, More Advanced Topics.

Unit III **(8 Hrs)**

Files and Data:

File handles, Reading Lines, Creating Filters, Reading More than One Line, Reading Paragraphs at a Time, Reading Entire Files, Writing To Files: Opening a File for Writing, Writing on a File handle, Writing Binary Data, Selecting a File handle, Permissions, Opening Pipes, File Tests, Directories.

References:

What Is a Reference?, The Lifecycle of a Reference, Using References for Complex Data Structures.

Subroutines:

The 'Difference' Between Functions and Subroutines, Understanding Subroutines, Subroutines for Calculation, Understanding Scope, References to Subroutines, Recursion.

Unit IV **(6 Hrs)**

Modules:

Types of Module, Why Do I Need Them?, Package Hierarchies, Exporters, The Perl Standard Modules: File::Find, Getopt::Std, Getopt::Long, File::Spec.

Object-Oriented Perl:

Working with Objects, Objects, Attributes, Methods, Classes, Polymorphism, Encapsulation, Inheritance, Constructors, Destructors Rolling Your Own: Bless You, My Reference, Storing Attributes, The Constructor, Considering Inheritance, Providing Attributes, Creating Methods Distinguishing ,Class and Object Methods, Get-Set Methods, Class Attributes, Privatizing Your Methods, Inheritance, Ties

Unit V **(6 Hrs)**

Introduction to CGI:

How Do I Get It to Work?, Writing CGI Scripts, HTTP Commands**,** Writing Interactive CGI Scripts, Debugging CGI Scripts, CGI Security, Taint Checking, CGI Wrappers.

Unit VI **(6 Hrs)**

Perl and Databases:

Perl and DBM: Which DBM Implementation To Use, Accessing DBM Databases, Checking the State of a DBM Database**,** Creating DBM Databases, Emptying the Contents of a DBM Database, Closing a DBM Database, Adding and Modifying DBM Entries, Reading DBM Entries, Deleting from a DBM Database Introducing DBI, First Steps - The Database Cycle.

Outcomes:

After completion of this course students should be able to

1. Understand basics of Perl .
2. Understand list arrays and hash.
3. Understand modules.
4. Understand CGI scripts.
5. Understand database connectivity.

Text Books

1. "*Beginning Perl*" by Simon Cozens, Peter Wainwrigth (Wrox Press Ltd.) ISBN:1-861003-14-5
2. "*Perl cook book*" by Tom Christiansen and Nathan Torkinton(O'Reilly Publications, 2nd Edition) ISBN: 978-0-596-00313-5.

Reference Books

1. "*Programming Perl*" by Larry Wall, Tom Christiansen and Jon Orwant (O'Reilly Publications, 4th Edition) ISBN: 978-0-596-00492-7.
2. "*Learning Perl*" by Randal L, Schwartz, Tom Phoenix (O'Reilly Publications, 6th Edition) ISBN: 978-1-4493-0358-7.

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Final Year U.G. Program in Information Technology (CGPA)

Effective from 2017-18

IT 405. ELECTIVE-III
PERL PROGRAMMING LAB

Teaching Scheme **P: 2**

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor will frame 10 Programs/Assignments based on the suggested list of experiments.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 10 practical assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments / Programs.

Term work should contain at least 10 programs covering the following topics of Perl Programming.

1. WAP in Perl to implement concept of List.
2. WAP in Perl to implement concept of arrays and arrays function.
3. WAP in Perl to implement concept of Hashes.
4. WAP in Perl to implement Regular Expression.
5. WAP in Perl to implement concept of Looping constructs.
6. WAP in Perl to implement concept of files and data.
7. WAP in Perl to implement concept of References.
8. WAP in Perl to implement concept of subroutines.
9. WAP in Perl to implement concept of Modules.
10. WAP in Perl to implement concept of Classes, Polymorphism, Inheritance.
11. WAP in Perl to implement concept of CGI scripts.
12. WAP in Perl to implement concept of database connectivity in Perl.

Practical Examination: Practical examination will be of 3 hours and it includes performance and viva-voce examination based on the term work.

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IT 406. ELECTIVE-III
GREEN IT – PRINCIPLES AND PRACTICES

Teaching Scheme **L:4**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand what Green IT is and How it can help improve environmental Sustainability
2. To understand the principles and practices of Green IT.
3. To understand how Green IT is adopted or deployed in enterprises.

Course Contents:

Unit – I Introduction **(06 Hrs)**

Environmental Impacts of IT, Holistic Approach to Greening IT, Green IT Standards and Eco-Labeling, Enterprise Green IT Strategy , Green IT: Burden or Opportunity?
Hardware: Life Cycle of a Device or Hardware, Reuse, Recycle and Dispose.
Software: Introduction, Energy-Saving Software Techniques, Evaluating and Measuring Software Impact to Platform Power.

Unit - II Software Development and Data Centers **(06 Hrs)**

Sustainable Software, Software Sustainability Attributes Software Sustainability Metrics, Sustainable Software Methodology, Data Centers and Associated Energy Challenges, Data Centre IT Infrastructure, Data Centre Facility Infrastructure: Implications for Energy Efficiency, IT Infrastructure Management, Green Data Centre Metrics.

Unit - III Data Storage and Communication **(06 Hrs)**

Storage Media Power Characteristics, Energy Management Techniques for Hard Disks, System-Level Energy Management, Objectives of Green Network Protocols, Green Network Protocols and Standards.

Unit - IV Information Systems, Green It Strategy and Metric **(06 Hrs)**

Approaching Green IT Strategies, Business Drivers of Green IT Strategy, Business Dimensions for Green IT Transformation, Multilevel Sustainable Information, Sustainability Hierarchy Models, Product Level Information, Individual Level Information, Functional Level Information, Organizational Level Information, Regional/City Level Information, Measuring the Maturity of Sustainable ICT.

Unit - V Green It Services and Roles **(06 Hrs)**

Factors Driving the Development of Sustainable IT, Sustainable IT Services (SITS), SITS Strategic Framework, Sustainable IT Roadmap, Organizational and Enterprise Greening, Information Systems in Greening Enterprises, Greening the Enterprise: IT Usage and Hardware, Inter-organizational Enterprise Activities and Green Issues, Enablers and Making the Case for IT and the Green Enterprise.

Unit – VI Managing and Regulating Green IT (06 Hrs)

Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and Social Media, The Regulatory Environment and IT Manufacturers, Non-regulatory Government Initiatives, Industry Associations and Standards Bodies, Green Building Standards, Green Data Centers, Social Movements and Greenpeace.

Outcomes :

1. Students will be able to create awareness among stakeholders and promote green agenda and green initiatives in their working environments leading to green movement.
2. This green movement will create new career opportunities for IT professionals, auditors and others with special skills such as energy efficiency, ethical IT assets disposal, carbon footprint estimation, reporting and development of green products, applications and services.

Text Book

1. "*Harnessing Green IT: Principles and Practices*" by San Murugesan, G. R. Gangadharan, WILEY 1st Edition. ISBN-10: 1119970059, ISBN-13: 978-1119970057

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IT 406. ELECTIVE-III
GREEN IT – PRINCIPLES AND PRACTICES LAB

Teaching Scheme	**P: 2**		
Evaluation Scheme	**Continuous Evaluation**	**ESE**	**Minimum Passing Marks**
	30 Marks	**70 Marks**	**40%**

Term Work:

1. Instructor will frame 8 Assignments based on the contents of above IT 406 syllabus. The assignments may include software programs/models/posters/etc.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs, etc. submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Practical Examination: Practical examination will be of 3 hours and it includes viva-voce examination based on the term work.

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IT 407. ELECTIVE-IV
SOFTWARE TESTING AND QUALITY ASSURANCE

Teaching Scheme **L:4**

Evaluation Scheme	MSE	ESE	Minimum Passing Marks
	20 Marks	80 Marks	40%

Course Objective:

1. To improve understanding of software testing skills- it's purpose, nature, issues and constraints.
2. To learn various software testing techniques through case studies.
3. To understand the essential characteristics of various automation tools used for testing.

Course Contents:

UNIT I: Introduction Software Quality **(07 Hrs)**

Software Quality Assurance Framework and standards SQA Framework: What is Quality? Software Quality Assurance, Components of Software Quality Assurance, Software Quality Assurance plan: Steps to develop and implement a Software Quality Assurance Plan Quality Standards: ISO 9000, CMM, CMMI, Malcom Balridge.

UNIT II: Introduction Software Testing **(07 Hrs)**

What Is a Bug? Terms for Software Failures, Software Bug: A Formal Definition, Why Do Bugs Occur? The Cost of Bugs, What Exactly Does a Software Tester Do?, What Makes a Good Software Tester? **The Realities of Software Testing:** Testing Axioms, Software Testing Terms and Definitions, Precision and Accuracy, Verification and Validation, Quality and Reliability

UNIT III: Testing Fundamentals **(08 Hrs)**

Black-Box and White-Box Testing, Test Planning And Design, Monitoring and Measuring Test Execution, **Unit Testing:** Concept of Unit Testing, Static Unit Testing, Dynamic Unit Testing, Debugging, Tools For Unit Testing, **System Integration Testing:** Concept Of Integration Testing, Different Types Of Interfaces And Interface Errors, Granularity Of System Integration Testing, System Integration Techniques

UNIT IV: Testing Techniques **(08 Hrs)**

Configuration Testing: An Overview of Configuration Testing, Approaching the Task **Compatibility Testing:** Compatibility Testing Overview, Platform and Application Versions **Foreign-Language Testing:** Translation Issues, Localization Issues, Configuration and Compatibility Issues

UNIT V: Testing Tactics (06 Hrs)

Usability Testing: User Interface Testing, What Makes a Good UI? Follow Standards or Guidelines, Intuitive, Consistent, Flexible, Comfortable, Correct, Useful.
Testing the Documentation: Types of Software Documentation, The Importance of Documentation Testing, The Realities of Documentation Testing
Testing For Software Security: WarGames, Understanding the Motivation, Threat Modeling

UNIT VI: Testing Tools (04 Hrs)

Automated Testing and Test Tools: The Benefits of Automation and Tools, Test Tools, Overview of Testing Tools, Testing an Application using WinRunner, Test Script Language, Selenium software testing tool, Use of LoadRunner and Rational functional tester(Case Studies).

Outcomes:

1. Apply modern software testing processes in relation to software development and project management.
2. Create test strategies and plans, design test cases, prioritize and execute them.
3. Manage incidents and risks within a project.

Text Books:

1."*Software Quality Assurance from Theory to Implementation*", by Daniel Galin, Pearson Education, ISBN 978-81-317-2395-1
2. "*Software Testing and Quality Assurance: Theory and Practice Book*" by Kshirasagar Naik and Priyadarshi Tripathy, Wiley Publication. ISBN-10: 0471789119, ISBN-13: 978-0471789116.
3. "*Software Testing*" Second Edition by Ron Patton, Pearson Education publishing by Sams, ISBN 978-81-7758-031-0

Reference Books:

1. "*Effective method for software testing*", 2nd edition by William E. Perry, Willey ISBN 13:978, 0, 7645, 9837,1.
2., "*Software Testing: Principles and Practices*", by Desikan, Ramesh, Pearson Education, ISBN 8l, 7758, 121, X
3. "*Metrics & Models in Software Quality Engineering*", Stephen H. Kan, Pearson Education, ISBN 81, 297, 0175, 8

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IT 408. ELECTIVE-IV
UNIFIED MODELING LANGUAGE

Teaching Scheme **L:4**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand various concepts of Unified Modeling Language.
2. To learn and implement UML views, static views, design views etc.
3. To understand deployment view, model management views.

Course Contents:

Unit I **(8 Hrs)**

UML Overview: Brief summary of UML, history, goal, complexity of UML, the nature and purpose of models.

UML walkthrough: UML view, static view, design view, use case view, static machine view, activity view, deployment view, model management view, profiles.

Unit II **(8 Hrs)**

Static view: classifier, relationships, associations, generalizations, Realization, Dependency, Constraint, Instance.

Design View: overview, structured classifier, collaboration, patterns, and components.

Unit III **(8Hrs)**

Use case view: overview, Actor, Use case.

State machine View: overview, state machine event, state transition, composite state.

Unit IV **(8 Hrs)**

Activity view: overview, Activity, activities and other views, Action.

Interaction View: overview, interaction, sequence diagram and communication diagram.

Unit V **(8 Hrs)**

Deployment view: overview, Node, Artifacts.

Model Management View: overview, packages, dependencies on packages, visibility, import and model.

Outcomes: Students will be able to

1. Create models for software applications.
2. Use the different UML notations for designing software.

Text Books:

1. "*The Unified Modeling Language Reference Manual*" by James Rumbaugh, Ivar Jacobson and Grady Booch (2th Edition, Addison Wesley) ISBN-0-321-24562-8.
2. "*The Unified Modeling Language User Guide "* by James Rumbaugh, Ivar Jacobson and Grady Booch (Pearson Edition) ISBN-978-81-7758-372-4.

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IT 409. ELECTIVE-IV
MOBILE APPLICATION DEVELOPMENT

Teaching Scheme	**L: 4**		
Evaluation Scheme	**MSE** **20 Marks**	**ESE** **80 Marks**	**Minimum Passing Marks** **40%**

Course Objectives:

1. To introduce student with new technology for mobile application.
2. To design the GUI of application and connect with backend.
3. To use location based services, to develop android services and publish android apps.

Course Contents:

Unit I Introduction (4 Hrs)
Android Programming: What is Android? , Obtaining the required tools, creating application, **Activities and Intents:** Understanding activities, intent, linking activities using intents, calling built-in application using intents, displaying notification.

Unit II Android User Interface and Design (8 Hrs)
Screen components: Views and View Groups, Linear Layout, Absolute Layout, Table Layout, Relative Layout, Frame Layout, Scroll View. **Display orientation:** Anchoring Views, Resizing and Repositioning. **Managing changes to screen orientation**: Detecting Orientation Changes, Controlling the Orientation of the Activity, listening for UI notifications, **Basic views**: Text View, Button, Image Button, Edit Text, Check Box, Toggle Button, Radio Button, RadioGroups. **Picker Views:** Time Picker, Date Picker, List Views, Spinner View.

Unit III Displaying pictures and menus (8 Hrs)
Gallery, Image View, Image switcher, Analog Clock View, Digital Clock View, Web View, **Menus With Views:** helper method, Option Menu, Context Menu. **Data Persistence:** getSharedPrefernces(), getPreferences(), saving data to internal storage and external storage. Creating and using databases by using DBAdapter helper class.

Unit IV Content Providers and Messaging (8 Hrs)
Sharing data in Android, **Content Provider:** Predefined Query String Constant, Projection, Filtering, Sorting, Creating own Content provider. **SMS Messaging:** Sending SMS, Getting feedback after sending SMS, Sending SMS using Intent, Receiving SMS, Sending e-mails.

Unit V Networking and Location-Based Services (8 Hrs)

Networking: Downloading binary data, downloading text files, accessing web services, performing synchronous calls. **Displaying Maps:** creating projects with map, obtaining map API keys, displaying map, displaying zoom control, changing views, navigating to location, adding markers, getting the location on the basis of touch, Geo coding and Reverse Geo coding and monitoring the location.

Unit VI Developing android services and publishing android applications (4 Hrs)

Creating own services: performing long-running task in services, performing repeated task in services, executing asynchronous task on separate threads by using Intent Service, communicating between service and activity, binding activities to services. **Preparing for publishing:** Versioning and digitally signing android application. **Deploying APK files:** using adb.exe tool, using web server, publishing on android market.

Outcomes:

1. Understanding Android as new technology for developing mobile application.
2. Understanding design of GUI, database and provide connection.
3. Understanding android services and publishing the android application on market.

Text Books:

1. *"Beginning Android Application Development"* by Wei-Meng Lee (Wiley India Pvt. Ltd.) ISBN-978-1-118-01711-1.
2. "*Android: A Programmer's Guide*" by Jerome DiMarzio (TMH) ISBN-9780071599887

Reference Books:

1. "*Android in Action*" by W. Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz (3rd edition, Manning Publication) ISBN-9781617290503
2. "*Android Cookbook*" by Android Community Expert (2nd edition O'REILLY Publication) ISBN-9781449388416.

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IT 410. ELECTIVE-IV

MANAGEMENT INFORMATION SYSTEMS

Teaching Scheme **L:4**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To learn different types of information systems in an organization
2. To understand various MIS operating in functional areas of an organization and explain its relationship with the various activities of the organization.
3. To know how MIS is developed and implemented for various levels in an organization.

Course Contents:

Unit I **(6 Hrs)**

The Role of Information Systems in Business Today, What's New in MIS, Strategic Business Objectives of Information Systems, The Interdependence Between Organizations and Information Systems, Perspectives On Information Systems

Case Study: Mashaweer

Unit II **(6 Hrs)**

Global E-Business and Collaboration, Business Processes and Information Systems, Types of Information Systems, Systems for Collaboration and Social Business, The Information Systems Function In Business

Case Study: Modernization of NTUC Income

Unit III **(6 Hrs)**

Information Systems, Organizations, and Strategy, Organizations and Information Systems, How Information Systems Impact Organizations and Business Firms, Using Information Systems to Achieve Competitive Advantage, Using Systems for Competitive Advantage: Management Issues

Unit IV **(6 Hrs)**

The Internet, Intranets, and Extranets, Use and functioning of the internet, Ethical and Societal Issues: Comcast, Packet Shaping, and Net Neutrality, The World Wide Web, Internet and Web Applications, Information Systems @ Work: Chevron Takes to the Clouds, Intranets and Extranets, Net Issues

Unit V **(8 Hrs)**

Business Information Systems, Electronic and Mobile Commerce, An Introduction to Electronic Commerce, An Introduction to Mobile Commerce, Electronic and Mobile Commerce Applications, Information Systems @ Work: MoneyAisle.com Puts Customers in Charge, Threats to Electronic and Mobile Commerce, Strategies for Successful E-Commerce and M-Commerce, Technology Infrastructure Required to Support E-Commerce and M-Commerce, Ethical and Societal Issues: Manipulating Cyberstatus

Unit VI **(8 Hrs)**

Information and Decision Support Systems, Decision Making and Problem Solving, An Overview of Management Information Systems, Ethical and Societal Issues: Web 2.0 MIS Finds Compromise Between Service and Privacy, Functional Aspects of the MIS, Information Systems @ Work: Pharmaceutical Company Reduces Time-to-Market, An Overview of Decision Support Systems, Components of a Decision Support System, Group Support Systems, Executive Support Systems

Outcomes:

1. Understand information systems and their uses.
2. Use computerized management information systems.
3. In-depth analysis and decision making.
4. Aware of security issues related to information systems.

Text Books:

1. *"Management Information Systems, Managing the Digital Firm"* by Kenneth C. Laudon, Jane P. Laudon (13th Edition, Pearson) ISBN 13: 978-0-273-78997-0
2. *"Principles of Information Systems, A Managerial Approach"* by Ralph M. Stair George W. Reynolds (9th Edition, Cengage Learning) ISBN-13:978–0-324–66528–4

Reference Books:

1. *"Management Information Systems"* by James A. O'Brien, George M. Marakas (10th Edition, MCGraw Hill Irwin) ISBN 978-0-07-337681-3

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APPLICATION DEVELOPMENT LAB USING ANDROID

Teaching Scheme **L:2 P:2**

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Course Objectives:

1. To introduce students to the fundamentals of Android platform.
2. To use and implement object oriented concept using Java.
3. To use and implement intent, activity, toast to develop mobile applications.
4. To design GUI and connect with database.

Course Contents:

Unit I **(05 Hrs)**

Introduction

History of Android, Introduction to Android Operating Systems, Android Development Tools, Android Architecture, **OOPs Concepts:** Inheritance, Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java Virtual Machine.

Unit II **(03 Hrs)**

Development Tools

Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android (Emulator), configuring the installed tools, creating a android project – Hello Word, run on emulator, Deploy it on USB-connected Android device.

Unit III **(04 Hrs)**

User Interface Architecture

Application context, application hierarchy, xml content, java content, importance of R.java file, importance of RAW folder, intents, Activity life cycle, multiple screen sizes.

Unit IV **(05 Hrs)**

User Interface Design

Basic of GUI, Form widgets, Text Fields, Layouts, Button control, Toggle Buttons, Spinners (Combo boxes), Images, Menu, and Dialog.

Unit V **(03 Hrs)**

Database

Understanding of SQLite database and Connecting with the database.

Outcomes:

Students will have

1. Understanding of different components of Android environment.
2. Understanding basics of android application development.
3. Understanding GUI design and connectivity with database using SQLite.

Text Books:

1. *"Android application development for java programmers"* by James C. Sheusi (Cengage Learning Publication) ISBN 978-1-133-59354-6.
2. "*Beginning Android Application Development"* by Wei-Meng Lee (Wiley India Pvt. Ltd.) ISBN-978-1-118-01711-1.

Reference Books:

1. *"Android in Action*" by W. Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz (3rd edition, Manning Publication) ISBN-9781617290503

Term Work

- Instructor will frame programs based on each topic of the above syllabus contents.
- Students will submit Term Work in the form of a journal that will include at least 10-12 programs. Each program will consist of pseudo algorithm, program listing with proper documentation and printout of the output.
- The assessment will be based on the following –
    1. Performance in the practical examination
    2. Record of programs submitted by the candidate.
    3. Setting goals higher than expected from problem statement
    4. Innovation & Creativity.
    5. Team building skills
    6. Technical writing skills

Practical Examination: Practical examination will be of 3 hours and it includes performance and viva-voce examination based on the term work.

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IT 412. INDUSTRIAL INTERNSHIP / CERTIFIED COURSE / TECHNICAL TRAINING

Teaching Scheme	**4/6 Week Internship/Training in Summer Vacation after 6th Semester (i.e after third year).**	
Evaluation Scheme	**CE 100Marks**	**Minimum Passing Marks 40%**

Course Objectives:

1. Gain practical experience of the corporate environment.
2. Apply knowledge and skills learned in the classroom to solve real life problems.
3. Understand career options in IT industry.
4. Learn professional and corporate behavior and ethics.
5. Enhance soft skills required for the industry.
6. Identify areas for future learning and skill development.
7. To learn project management skills.
8. To study the industry profile, background, Vision, Mission, Quality policy, Product/service profile
9. Detailed study of various departments and the product life cycle.

Course Discription:

An internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional network. Every student should undergo industrial training or technical training for a period of one month during summer vacation. In case the students do not get an opportunity for training as mentioned he/she can do a certified course in summer vacation. He/she has to prepare and submit report which will be evaluated through the seminar given by student in the first term (7^{th} Semester) of the final year. Industrial Training refers to work experience gained during the program of study that is relevant to professional development prior to graduation. The fundamental objective of Industrial Training is to prepare students for future employment in their chosen engineering discipline. Industrial Training enhances the academic material studied at University by allowing students to practice what they have learned and to develop key professional attributes.

Evaluation scheme:

Parameters	Weightage
Selection in Industry for intership through recruitment drive	10%
Organizational Feedback /Certificate	20%
Internship Experience Report, Resume	30%
Internship Verification /Evaluations	20%
Presentation	20%

Course Contents/Expectations:

To receive credit for the internship, students are required to join the software industry / training institute and complete all assignments and submit them by the deadline, and present themselves in a professional manner at all times. Students are responsible for all materials and announcements related to the course. Additionally, students are representing themselves, as an engineerig college interns at the organization. Students are expected to:

1. Arrive at work as scheduled, ready to work, and stay for the agreed upon time.
2. Present yourself in a professional manner at all times, including being appropriately dressed for your workplace.
3. Communicate any concerns with your supervisor and the internship coordinator.
4. Demonstrate enthusiasm and interest in what you are doing; ask questions and take initiative as and when needed.
5. Complete and submit assigned tasks by designated timelines. Meet all deadlines.
6. Participate in assigned meetings at work and with the internship coordinator when you return to college.
7. Keep track of and accurately report internship hours worked.

Suggested list of certified courses:

- IoT
- Course CGI (Computer Generated Imaginery)
- Big Data and Hadoop Technologies.
- Course in SAP Business
- Embedded System Design
- Robotics
- Raspberry Pi
- Python Programming for IoT
- 3G/4G/5G cellular network design and deployment.
- Course in Machine Learning, Augmented Reality, Virtual Reality
- Advanced Study Program in Web Design
- Web Application Development
- Android Application Development
- iOS Application Development
- Database Technologies – Oracle/DB2/Microsoft SQL Server

- Database Administration
- Cloud Technologies
- C# and .NET
- Perl Programming
- Course in Graphic Design and Animation.
- Java Programming
- Cisco CCENT
- Cisco Certified Network Associate (CCNA)
- Cisco Certified Network Professional Routing and Switching (CCNP)
- Cisco Certified Network Associate Security Credential (CCNA)
- Certified Information Security Manager (CISM)
- Certified Information Systems Security Professional (CISSP)
- Microsoft Technology Associate (MTA)
- Microsoft Certified Solutions Associate (MCSA)
- Microsoft Certified Solutions Expert (MCSE)
- Microsoft Certified Solutions Developer (MCSD)
- Linux/Unix System Administration.
- Any other courses with prior approval of Head of Department.

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IT 413. PROJECT- I

	Teaching Scheme	**P: 4**	
Evaluation Scheme	**Continuous Evaluation**	**ESE**	**Minimum Passing Marks**
	50 Marks	**50 Marks**	**40%**

Evaluation criteria

The continuous evaluation of term work shall be of 50 Marks. The 45 Marks shall be distributed over 03 internal assessments / reviews during the semester by a review committee. The remaining 05 Marks shall be distributed for attendance. The Head of the department shall constitute the review committee. The student shall make a presentation on the progress made before the committee. The 50 Marks of the practical will be awarded based on the performance in the practical examination conducted by the University at the end of the semester.

General suggestions and expectations / guidelines

1. Two different projects can be done in Semester VII and Semester VIII **OR** a single project can be continued in two semesters depending on scope of the project and approval from the Head of Department.
2. Project work must be carried out by the group of **at most three** students and in special case four (subject to approval by HOD), who will jointly work and implement the project. **The work must be original**.
3. To proceed with the project work it is very important to select a right topic. Project can be undertaken on any subject addressing Information Technology / any subject studied in previous semesters. Research and development projects on problems of practical and theoretical interest should be encouraged.
4. Project shall be any one of the following:
    - Creation of software, hardware or middleware related to Information Technology/Computer Engineering/Inter-disciplinary Technologies.
    - Fabrication of devices preferably those devices energized from converging technologies.

- Creation of experimental setup and experimentation based on technological literature in the public domain .

5. Students should submit the Project Topic along with Project Abstract and Team Members details for the approval. Project Topic Must be approved by HOD and Project Coordinator.
6. The project work can be undertaken in a research institute or organization / company / any business establishment after taking prior approval of HOD.
7. Before Implementation students must submit the project documentation in the form of SRS (i.e. System Specification Requirements) that includes:
    - System Details
    - Data Model (If Back End is used) /ER Diagrams /DFD and UML diagrams.
    - Module Description
    - Module allocation to every team member
8. Even though project is a Group Activity, still it needs contribution of every team member as an individual; hence each team member must equally contribute in implementation of project.
9. Project Report format will be decided by Project Coordinator and same should be followed by the students.
10. Student must submit Project report at least 2 weeks before the end of semester.
11. If a project is found to be Purchased/Downloaded/Copied, it will be rejected at any stage and the team will be penalized or declared failed as decided by the examiners.
12. Students can continue with same Project Topic for Eighth Semester with the prior approval. HOD will approve the same depending upon the scope of the project.
13. If a **one semester project** is undertaken then:

    (a) For Project I : The group should complete the Project-I in Semester VII only and prepare a project report in **Spiral Bound** which contains following details:- Abstract, Project overview, Problem Statement, Requirement Analysis, Project design, Implementation Details, Technologies used, Results, Conclusion and References.

    (b) For Project II : The group will submit the name of the New Project with a synopsis of the proposed work in not more than 03 to 08 pages. The group will submit a final **Hardbound** project report at the end of VIII semester as per specified format.
14. If a **two semester project** is undertaken then:

For Project I : The group will submit the name of the project with a synopsis of the proposed work in not more than 03 to 08 pages. The group should complete detail system analysis and design, data flow design, data structure layout, file design, Procurement of Hardware and/or software requirements, and partial implementation of the project in Semester VII. The group should prepare a **Spiral Bound** project report containing the work carried out in Semester VII and Implementation Plan for Semester VIII at the end of the Semester VII as a part of the term work submission.

For Project II : The group will continue to work on the project selected during the Semester VII and submit a final **Hardbound** project report at the end of Semester VIII containing Complete Implementation of the Project with results, conclusion and future work as per specified format.

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IT 414.

MOBILE COMMUNICATION

Teaching Scheme **L: 4**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand the various terminology, principles, devices, schemes, concepts, generations, and different methodologies used in Mobile and Wireless Communication Networks.
2. To introduce the student to the major concepts involved in Wireless LAN (IEEE 802.11), and Bluetooth.
3. To study the operation of basic cellular system and performance criterion, handoff mechanism, etc.
4. To expose students to emerging technologies and their potential impact.

Course Contents:

Unit I **(4 hrs)**

Introduction: Applications, A market for mobile communications, Some open research topics, A simplified reference model, Frequencies for radio transmission, Regulations, Signals, Antennas, Signal propagation Multiplexing, Modulation, Spread Spectrum, Motivation for a specialized MAC, SDMA,FDMA, TDMA, Carrier sense multiple access, Multiple access with collision avoidance, polling, CDMA, Comparison of S/T/F/CDMA ,

Unit II **(8 hrs)**

Wireless LAN: Infra red vs radio transmission, Infrastructure and ad-hoc network, IEEE 802.11, System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, 802.11b, 802.11a, newer developments, Wifi Dual Band, Wi-Fi Direct.**Bluetooth:** User scenarious, Architecture, Radio layer, Baseband layer, Link manager protocol, L2CAP, Security, SDP, Profiles. A2DP (Advanced Audio Distribution Profile), aptX, Enhanced Data Rate (EDR) in Bluetooth v2.0, Bluetooth High Speed (HS) in Bluetooth version 3.0+HS, Bluetooth Specification 4.0 (called Bluetooth Smart), BLE (Bluetooth Low Energy), Bluetooth Beacons in BLE, Bluetooth 4.1.

Unit III **(9 hrs)**

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.**GSM:** Mobile services System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, New data services. **3G Systems**: UMTS and IMT-2000, UMTS releases and standardization, UMTS system architectures, UMTS radio interface UTRAN, Core network, Handover, High-Speed Downlink Packet Access (HSDPA), EV-DO Rev. A (Revision A), High-Speed Packet Access (HSPA+).

Unit IV **(7 hrs)**

LTE and LTE Advanced (4G): What is MIMO?, Why MIMO?,LTE and LTE-Advanced Requirements, 3GPP Specification, LTE Architecture, EPC Elements, LTE Components-OFDM OFDMA, MIMO & Precoding, Handover & Packet Forwarding, MBMS (Multimedia Broadcast Multicast Service).

LTE-Advanced-ICIC (Inter-Cell Interference Coordination) & FFR (Fractional Frequency Reuse), DSA (Dynamic Subcarrier Assignment), CoMP (Coordinated Multi Point), CA (Carrier Aggregation), HetNet (Heterogeneous Network) & Small Cells, SON (Self-Organizing Network), SON Functionality.

Unit V **(6 hrs)**

5G Technology: 5G Vision: Service, Technology, Standards, Key Enabling Technologies-Advanced Network-SDN (Software-defined Network) and NFV (Network Functions Virtualization), mmWave, Multi-RAT (Radio Access Technology), Advanced MIMO (Multi-Input Multi-Output), Multiple Access, Advanced D2D (Device-to-Device), Advanced Small Cell, 5G Target Performance.

Unit VI **(6 hrs)**

Mobile network layer, Mobile IP, Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, Routing, Destination sequence distance vector, Dynamic source routing. Traditional TCP, Implications of mobility, Classical TCP improvements, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/time –out freezing, Selective retransmission, Transaction-oriented TCP,TCP over 2.5/3G wireless networks, Performance enhancing proxies.WAP Architecture.

Course Outcomes:
After completing this course, students will

1. Have the understanding of different generations, terminologies, systems, operations and design of wireless and mobile communications.
2. Acquire sufficient knowledge about IEEE 802.11 and Bluetooth standards.
3. Be able appreciate the contribution of Mobile and Wireless Communication networks to overall technological growth.

4. Understand the concepts and technology involved in 3G, 4G and 5G Networks.

Text Book:

1. *"Mobile Communications"* by Jochen Schiller, Second Edition, Pearson India Ltd. ISBN: 978-81-317-2426-2.

2. *"Wireless Communications: Principles & Practice" by* T.S.Rappaport, Pearson Education. ISBN-10: 9332535795, ISBN-13: 978-9332535794.

Reference Books:

1."3G Evolution: HSPA and LTE for Mobile Broadband" by Erik Dahlman, Stefan Parkvall, Johan Skold, Per Beming, Academic Press , ISBN-10: 012372533X, ISBN-13: 978-0123725332.

2. "*Foundations of Modern Networking*" by William Stallings, Pearson Education India; 1st Ed. ISBN-10: 9332573867, ISBN-13: 978-9332573864.

3. "*4G, LTE-Advanced Pro and The Road to 5G*" by Erik Dahlman, Stefan Parkvall, Johan Skold, Academic Press. 3rd Edition. ISBN-10: 0128045752, ISBN-13: 978-0128045756.

4. "*5G Mobile and Wireless Communications Technology*" by Mischa Dohler, Takehiro Nakamura, Afif Osseiran. Cambridge University Press,1st Edition. ISBN-10: 1107130093 ISBN-13: 978-1107130098.

5. "Wireless Communication and Networks 3G and Beyond" by Iti Shah Mishra Second Edition, McGraw Hill Education ISBN-13: 978-1-25-906273-5.

6. "Wireless and Mobile Networks, Concepts and Protocols" by Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, 2ed, Wiley India, ISBN 13:9788126558551

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IT 414.

MOBILE COMMUNICATION LAB

Teaching Scheme	**P: 2**		
Evaluation Scheme	**Continuous Evaluation 30 Marks**	**ESE 70 Marks**	**Minimum Passing Marks 40%**

Term Work:

1. Instructor will frame 8 Programs/Assignments based on the suggested list of experiments.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practical assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments / Programs.

1. Build and exchange data in simple infrastructure and adhoc network by using personal computer and Android based mobile
2. Design WLAN using IEEE 802.11.
3. Implement Mobile device as a wireless access point.
4. Configure Wireless Access Point (WAP) and build different networks.
5. 802.11 Packet Analysis using Wireless Protocol Analyzer Tool (Wireshark,etc.).
6. Installation of NS2 in Ubuntu 12.04 Linux.
7. Implement wireless network. Capture data frame and identify fields using NS2.
8. Develop sample wireless network in which
    a. Implement wireless routing protocol.
    b. Calculate the time to receive reply from the receiver using NS2.
    c. Generate graphs which show the transmission time for packet.
9. Study of different features of 2G, 2.5G, 3G, 4G and 5G networks on Trainer Kits.
10. Mini-project (application) for android / iOS based smartphone.
11. A site visit can be arranged to Local BSNL or any other wireless service provider to study GSM Base Stations, MSC, etc

Using Wireless Communication Toolbox in MATLAB:

12. Free space Propagation – Path Loss model to determine the free space loss and the power received using Matlab program.
13. Introduction to the IEEE80211.a WLAN PHY Communication Toolbox in MATLAB
    a. What is IEEE 802.11a WLAN PHY? Briefly explain the functions of each blue block in the model diagram.
    b. What type of shadowing is IEEE802.11 WLAN based on.
14. Investigation on WLAN Multipath Channel
15. Plot BER-SNR and Bit Rate-SNR graphs for different types of fading channel
    i. No Fading
    ii. Flat Fading
    iii. Dispersive Fading
16. Introduction to Simulink
    a. Familiarize with the block components of Simulink in MATLAB
    b. Setup a basic integrator for a square wave input and note the parameters like amplitude, frequency, etc.
17. Implement a Direct Sequence Spread Spectrum with Matlab Simulink.

Practical Examination: Practical examination will be of 3 hours and it includes performance and viva-voce examination based on the term work.

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IT 415. INFORMATION TECHNOLOGY PROJECT MANAGEMENT

Teaching Scheme L:4

Evaluation Scheme	MSE	ESE	Minimum Passing Marks
	20 Marks	80 Marks	40%

Course Objectives:

1. To get introduced to the IT project management needs and methodologies.
2. To be able to understand and learn managerial skills.
3. To have the detailed knowledge of implementation of IT project management.

Course Contents:

Unit I: An Overview of IT project management (8 Hrs)

The state of IT project management, context of project management, need of project management, project goals, project life cycle and IT development, extreme project management, PMBOK.

Conceptualizing and Initializing the IT Project: An information technology project methodology (ITPM), project feasibility, request for proposal (RFP), the business case, project selection and approval, project contracting, IT governance and the project management office.

Unit II: The Human Side of Project Management (7 Hrs)

Introduction to human side of project management, organization and project planning, the project team, the project environment.

Developing the Project Charter and Project Plan: project management process, project integration management, the project charter, project planning framework, the contents of a project plan, the planning process, The Work Breakdown Structure (WBS).

Unit III: Managing Change, Resistance and Conflicts (5 Hrs)

The nature of change, the change management plan, dealing with resistance and conflicts.

Managing Project Procurement and Outsourcing: Introduction, project procurement management, outsourcing.

Unit IV: The Scope Management Plan (8 Hrs)

Scope planning, project scope definition, project scope verification, scope change control.

The Project's Schedule, Budget and Risk Management: Introduction, developing the project schedule, project management software tools, methods of budgeting, developing the project, budget, improving cost estimates, finalizing the project schedule and budget, IT project risk management planning process, identifying IT project risks, risk analysis and assessment, risk strategies, risk monitoring and control, risk responses and evaluation.

Unit V: The Project Communication Plan (8 Hrs)

Introduction to project communication plan, monitoring and controlling the project, the project communications plan, project metric, project control, designing the control system, the plan, monitor, control cycle, data collection and reporting, reporting performance and progress, information distribution.

Allocating Resources to the Project: Resource loading, resource leveling, allocating scarce resources to projects and several projects, Goldratt's critical chain.

Unit VI: Project Leadership and Ethics (4 Hrs)

Introduction to leadership, project leadership, ethics in projects, multicultural projects.

The Implementation Plan and Project Closure: Introduction, project implementation, administrative closure, project evaluation, project audit.

Outcomes:

1. Understanding necessity of management.
2. Understanding the difference between management and leadership.
3. Understanding the steps of IT project management.

Text Books:

1. *"Information Technology Project Management"* by Jack T. Marchewka, 3rd edition, Wiley India ISBN-978-81-2652-318-4.

Reference Books:

1. *"Software Project Management in Practice"* by Pankaj Jalote, Pearson Education, ISBN-978-81-7758-857-6.

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IT 416. ELECTIVE-V

CLOUD COMPUTING

	Teaching Scheme	**L:4**	
Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objective:

This course will help the students to get familiar with

1. Cloud computing fundamentals and architecture.
2. Cloud computing services and implementation.
3. Cloud computing implementation and deployment techniques.

Course Contents:

Unit I **(7 Hrs)**

Introduction to Cloud Computing:
Cloud computing in nutshell, Roots of cloud computing, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks.

The Enterprise Cloud Computing Paradigm:
Relevant Deployment Models for Enterprise Cloud Computing, Adoption and Consumption Strategies.

Unit II **(8 Hrs)**

Virtual Machines Provisioning and Migration Services:
Introduction and Inspiration, Virtualization Technology Overview, Public Cloud and Infrastructure Services, Private Cloud and Infrastructure Services, Distributed Management of Virtualization, High Availability, Cloud and Virtualization Standardization Efforts, OCCI and OGF, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action, Provisioning in the Cloud Context.

On the Management of Virtual Machines for Cloud Infrastructures:
The Anatomy of Cloud Infrastructures, Distributed Management of Virtual Infrastructures, Scheduling Techniques for Advance Reservation of Capacity.

Unit III **(7 Hrs)**

Enhancing Cloud Computing Environments Using a Cluster as a Service:

Amazon Elastic Compute Cloud (EC2), Google App Engine, Microsoft Windows Azure, Salesforce.

Secure Distributed Data Storage in Cloud Computing:

Cloud Storage: from LANs TO WANs, Moving From LANs to WANs, Existing Commercial Cloud Services, Amazon's Web Service, Microsoft Windows Azure, Google App Engine, Technologies for Data Security in Cloud Computing, Database Outsourcing and Query Integrity Assurance.

Unit IV **(7 Hrs)**

Aneka—Integration of Private and Public Clouds:

Aneka Cloud Platform, Aneka Resource Provisioning Service, Resource Provisioning Scenario, Hybrid Cloud Implementation, Design and Implementation Guidelines, Aneka Hybrid Cloud Architecture.

CometCloud: An Autonomic Cloud Engine:

CometCloud Architecture, CometCloud Layered Abstractions, Comet Space, Autonomic Behavior of CometCloud, Autonomic Cloudbursting, Autonomic Cloudbridging.

Unit V **(4 Hrs)**

T-Systems' Cloud-Based Solutions for Business Applications

What Enterprises Demand of Cloud Computing, Changing Markets, Increased Productivity, Rising Cost Pressure, Importance of Quality and Security in Clouds, Compliance and Security.

Unit VI **(7 Hrs)**

Data Security in the Cloud:

An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, Homo Sapiens and Digital Information, Cloud Computing and Data Security Risk, Cloud Computing and Identity, Identity, Reputation, and Trust, Identity for Identity's Sake, Cloud Identity: User-Centric and Open-Identity Systems, The Philosophy of User-Centric Identity, User-Centric but Manageable, What Is an Information Card, Using Information Cards to Protect Data, Weakness and Strengths of Information Cards, Cross-Border Aspects of Information Cards, The Cloud, Digital Identity, and Data Security, Content Level Security—Pros and Cons.

Outcomes:

After completion of the course the learner should be able to:

1. Differentiate different computing techniques.
2. Compare various cloud computing providers/ Software.
3. Understand risks involved in cloud computing.

Text Books:

1. "*Cloud Computing Principles and Paradigms*" by Rajkumar Buyya, James Broberg, Andrzej Goscinski (Wiley Eastern Ltd.) ISBN 978-0-470-88799-8 (hardback)
2. *"Distributed and Cloud Computing" by* Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra (MK Publication) ISBN: 978-0-12-385880-1
3. "*Cloud computing Black Book*" by Kailash Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Dr. Deven Shah, KLSI (Dreamtech Publication) ISBN: 978-9-35-119418-7

Reference Books:

1. "*Using Google App Engine Building Web Applications*" by Charles Severance (O'reilly Publication) ISBN: 978-0-596-80069-7.
2. "*Programming Amazon EC2*" by, Jurg van Vliet, Flavia Paganelli (O'reilly Publication). ISBN: 978-1-4493-9368-7.
3. "*Cloud security: A Comprehensive Guide to Secure Cloud Computing*" by , Ronald L. Krutz, Russell Dean Vines (Wiley Publication). ISBN: 978-0-470-93894-2.

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IT 416. ELECTIVE-V

CLOUD COMPUTING LAB

Teaching Scheme	**P: 2**		
Evaluation Scheme	**Continuous Evaluation 30 Marks**	**ESE 70 Marks**	**Minimum Passing Marks 40%**

Term Work:

1. Instructor will frame 8 Programs/Assignments based on the suggested list of experiments.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practical assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments / Programs.

1. Study of Cloud Computing & Architecture.
2. Virtualization in Cloud.
3. Study and implementation of Infrastructure as a Service.
4. Implementation of identity management using OpenStack.
5. Write a program for web feed.
6. Case study on Amazon EC2.
7. Case study on Microsoft azure.
8. Case study on Google App Engine.
9. Creating a Warehouse Application in SalesForce.com.
10. Creating an Application in SalesForce.com using Apex programming Language.
11. Study of Google document.
12. Study of collaboration using Google Document.
13. Study of Google Calendar.

14. Study of various conferencing tools.

Practical Examination: Practical examination will be of three hours that includes performing an experiment/ oral based on syllabus.

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IT 417. ELECTIVE-V

DISTRIBUTED SYSTEM

Teaching Scheme **L:4**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. This course provides an introduction to the fundamentals of distributed computing systems, assuming the availability of facilities for data transmission.
2. To learn the principles, architectures, algorithms and programming models used in distributed systems.
3. The structure of distributed systems using multiple levels of software is emphasized. Specific topics include: distributed algorithms, distributed file systems, distributed databases, security and protection distributed services such as the world-wide web.

Course Contents:

Unit I **(07 Hrs)**

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

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

Unit II **(07 Hrs)**

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

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

Unit III **(08 Hrs)**

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

Consistency and Replications: Introductions, Data Centric consistency models, Client centric consistency model, Distribution Protocols, Consistency protocols.

Unit IV **(08Hrs)**

Fault Tolerance: Introduction, Process Resilience, Reliable Client-server communication, Distributed Commit, Recovery.

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

Unit V **(05 Hrs)**

Distributed file systems: Sun network file system, the coda file systems, other file systems and their comparisons.

Unit VI **(05Hrs)**

Distributed document based systems: The World Wide Web: Communications, Processes, Synchronization, Caching and Replications Fault Tolerance. Lotus Notes and its comparison.

Outcomes: By the end of the course students will be able to

1. Understand key features of the Distributed Systems such as Communications, Processes, Synchronization, Fault Tolerance, Consistency and Replications.
2. Use and apply important methods in distributed systems to support scalability and fault Tolerance.
3. Design and implement distributed applications of Distributed Systems.

Text Books:

1. "*Distributed System*" by Tanenbaum & Steen, PHI, 2002, ISBN 0-13-148521-0.

Reference Books:

1. "*Distributed System: Concepts and Design*", by Coulouris, Dollimore, Kindberg, Pearson Education, 2011, ISBN : 978-81-317-1840-7.
2. "*Distributed Operating System*" by P.K.Sinha, Addison Wesley, 2003, ISBN 6321117891.
3. "*Advanced Concept in Operating Systems*" by Singhal & Shivaratri, McGraw Hill Publication, 1996, ISBN: 0-7803-1119-1.

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IT 417. ELECTIVE-V

DISTRIBUTED SYSTEM LAB

Teaching Scheme	**P: 2**		
Evaluation Scheme	**Continuous Evaluation 30 Marks**	**ESE 70 Marks**	**Minimum Passing Marks 40%**

Term Work:

- Instructor will frame 8 experiments based on the suggested experiments as given below. Instructors are expected to incorporate variations in list.
- Students will submit Term Work in the form of a journal that will include at least 8 experiments from the list given below. Each experiment will consists of pseudo-algorithm, program listing with proper documentation and printout of the output.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Setting goals higher than expected from problem statement.
4. Innovation & Creativity.
5. Team building skills.
6. Technical writing skills.

Suggested list of experiments:

1. Write a Program to implement Concurrent Echo Client Server Application.
2. Write the Programs for Remote Procedure call.
3. Write the Programs for Remote Method Invocation.
4. Write the Programs for Thread Programming in JAVA.
5. Implement CORBA file.
6. Write a Program to Increment a Counter in Shared Memory.
7. Implement Network File System (NFS).
8. Creation of a BPEL (Business Process Execution Language) Module and a Composite Application.
9. Study of Web Service Programming.
10. Study of Grid Services using various Tools.

Practical Examination: Practical Examination will consist of Performance and Viva-voice Examination based on the term work.

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IT 418. ELECTIVE-V

INTERNET OF THINGS

	Teaching Scheme	**L:4**	
Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To learn physical design, logical design and enabling technologies of internet of things.
2. To acquire knowledge about IoT platforms design methodology.
3. To learn about IoT physical servers and cloud offerings.
4. To study IoT case studies using python.

Unit I **(6 hrs)**

Introduction to internet of Things, Physical Design of IoT, Logical design of IoT, IoT enabling technologies, IoT levels & deployment templates, Domain specific IoTs: Home automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle

Unit II **(6 hrs)**

IoT and M2M: Introduction, M2M, difference between IoT and M2M,SDN and NFV for IoT, IoT system management with NETCONF-YANG: Need for IoT systems management, simple network management protocol(SNMP), Network operator requirements, NETCONF, YANG, IoT systems management with NETCONF-YANG, NETOPEER.

Unit III **(7 hrs)**

IoT platforms design methodology, introduction, IoT design methodology, step 1: purpose & requirements specification, step 2: process specification, step 3: domain model specification, step4: information model specification, step 5: service specifications, step 6: IoT level specification, step 7: functional view specification, step 8: operational view specification, step 9: device & component integration, step 10: application development, case study on IoT system for weather monitoring, motivation for using python.

Unit IV **(7 hrs)**

Iot systems- logical design using python: Introduction, installing python, python data types & data structures, numbers , strings, lists, tuples, dictionaries, type conversions, control flow, if, for, while, range, break/continue, pass, functions, modules, packages, file handling, date/time operations, classes, python packages of internet for IoT, JSON, XML, HTTPLib & URLLib.

Unit V **(7 hrs)**

IoT physical devices & endpoints: What is an IoT device, basic building blocks of an IoT device, exemplary device: raspberry PI, about the board, linux on raspberry Pi, Raspberry Pi interface, serial, SPI, I2C, Programming raspberry Pi with python, controlling LED with raspberry Pi, interfacing an LED and switch with raspberry Pi, interfacing a light sensor (LDR) with raspberry Pi, other IoT devices, pcDuino, Beaglebone black, cubieboard.

Unit VI **(7 hrs)**

IoT physical servers & cloud offerings:Introduction to cloud storage models & communication APIs, WAMP – AutoBahn for IoT, Xively cloud for IoT, Python web application framework – Django, Django architecture, starting development with Django, Designing a RESTful web API, Amazon web services for IoT, Amazon EC2, Amazon AutoScaling, Amazon S3, Amazon Dynamo DB, Amazon Kinesis, Amazon SQS, Amazon EMR, SkyNet IoT messaging platform. Case studies illustrating IoT Design: home automation, cities, environment, agriculture, productivity applications IoT printer.

Course outcomes:

1. Understand principles, concepts, and technologies for internet of things.
2. Able to build physical and logical design of IoT systems.
3. Understand cloud platforms for IoT.

Text Book:

1. "*Internet of Things: A hands-on approach*", by Arshdeep Bahga,Vijay Madisetti, Universities Press India Pvt. Ltd.ISBN:978 81 7371 954 7.

Reference Books:

1. "*Designing The Internet of Things*" by Hakin Cassimally, Adrian Mcewen, Wiley. ISBN-10: 8126556862, ISBN-13: 978-8126556861.
2. "*Getting Started with the Internet of Things*" by Cuno Pfister, Shroff; First Edition ISBN-10: 9350234130, ISBN-13: 978-9350234136.
3. "*The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black*" by Donald Norris, McGraw-Hill Education. ISBN-10: 0071835202, ISBN-13: 978-0071835206.
4. "*The Internet of Things: Key Applications and Protocols*" by David Boswarthick, Omar Elloumi, Olivier Hersent ,Wiley. ISBN-10: 8126557656, ISBN-13: 978-8126557653.

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IT 418. ELECTIVE-V

INTERNET OF THINGS LAB

	Teaching Scheme		**P: 2**
Evaluation Scheme	**Continuous Evaluation 30 Marks**	**ESE 70 Marks**	**Minimum Passing Marks 40%**

Term Work:

1. Instructor will frame 8 Programs / Assignments based on the above syllabus of IT 418.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practical assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Practical Examination: Practical examination will be of three hours that includes performing an experiment/ oral based on syllabus.

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IT 419. ELECTIVE-V

ADVANCED COMPUTER ARCHITECTURE

Teaching Scheme **L:4**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To provide a comprehensive knowledge of scalable and parallel computer architectures.
2. To understand how to achieve better performance with increased system resources.
3. To learn how system resources are scaled by the number of processors used, the memory capacity enlarged, the access latency tolerated, the I/O bandwidth required, the performance level desired.

Course Contents:

Unit I Parallel Computer Models **(06 Hrs)**

The state of computing, multiprocessors and multicomputers, Multivector and SIMD computers, Architectural development tracks. Conditions of parallelism, Program partitioning and scheduling, Program flow mechanism, System interconnect architectures

Unit II Program and Network Properties **(06 Hrs)**

Performance metrics and measures, Parallel processing applications, Speedup performance laws, Scalability analysis and Approaches, Advanced processor technology, Superscalar and Vector Processors.

Unit III Bus Cache and Shared Memory **(06 Hrs)**

Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models

Unit IV Pipelining and Superscalar Techniques (08 Hrs)

Linear pipeline processors, Nonlinear pipeline processors, Instruction pipeline design, Arithmetic pipeline design, Superscalar pipeline design

Unit V Parallel and Scalable Architectures (08 Hrs)

Multiprocessors and Multicomputers: Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms

Multivector and SIMD Computers **:** Vector processing principles, Multivector multiprocessors, Compound vector processing, SIMD computer organizations, The connection machine CM-5

Unit VI Scalable, Multithreaded, and Dataflow Architectures (06 Hrs)

Latency hiding techniques, Principles of multithreading, Fine grain multicomputers, Scalable and multithreaded architectures, Dataflow and hybrid architectures,

Trends in Parallel Systems: AMD Opteron, Intel Pentium Processors.

Outcomes:

1. Understand different processor architectures and system-level design processes.
2. Understand the principles of I/O in computer systems, including viable mechanisms for I/O and secondary storage organization.
3. Understand different processor architectures and system-level design processes

Text Books:

1. '*Advanced Computer Architecture: Parallelism, Scalability, Programmability'*, by Kai Hwang McGraw Hill, Inc., 1993. ISBN-10: 0070316228 , ISBN-13: 978-0070316225.
2. "*Computer organization and architecture, designing for performance*", by Stallings, William Prentice Hall of India.

Reference Book:

1. '*Computer Architecture and Parallel Processing'* by Hwang and Briggs McGraw Hill Book Company. ISBN 10: 0070315566, ISBN 13: 9780070315563.

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IT 419. ELECTIVE-V

ADVANCED COMPUTER ARCHITECTURE LAB

Teaching Scheme	**P: 2**		
Evaluation Scheme	**Continuous Evaluation 30 Marks**	**ESE 70 Marks**	**Minimum Passing Marks 40%**

Term Work:

1. Instructor will frame 8 Programs/Assignments based on the above syllabus of IT 419.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practical assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Practical Examination: Practical examination will be of 3 hours and it includes viva-voce examination based on the term work.

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IT 420: ELECTIVE VI

CYBER SECURITY

Teaching Scheme **L: 4 T: 0**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To make students familiar with the fundamental concepts of computer ethics.
2. To know the linkage between computer, professional, philosophical ethics and decision making.
3. To develop the concepts in computer forensics.
4. To give emphasis on how cyber security operations are carried out.
5. To introduce the linkage between technology, law and ethics and IT Act.

Course Contents:

Unit-I: Introduction to Cybercrime (6Hrs)

Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000.

Unit-II: Cyber Crime: Mobile and Wireless Devices (7Hrs)

Trend mobility, authentication service security, Attacks on mobile phones, mobile phone security Implications for organizations, Organizational measurement for Handling mobile, Security policies and measures in mobile computing era.

Unit-III: Tools and methods used in Cyber Crime (7 Hrs)

Proxy servers and Anonymizers, Phishing, Password cracking, Key loggers and Spy wares, Virus and worms, Trojan Horse and Backdoors, Steganography, SQL Injection, Buffer overflow, Attacks on wireless network.

Unit-IV: Understanding computer forensic (6Hrs)

Historical background of cyber forensic, Forensic analysis of e-mail, Digital forensic life cycle, Network forensic, Setting up a computer forensic Laboratory, Relevance of the OSI 7 Layer model to computer Forensic, Computer forensic from compliance perspectives.

Unit-V:Forensic of Hand –Held Devices (7Hrs)

Understanding cell phone working characteristics, Hand-Held devices and digital forensic, Toolkits for Hand-Held device, Forensic of i-pod and digital music devices, Techno legal Challenges with evidence from hand-held Devices.

Unit-VI: Cyber Security –Organizational implications (7 Hrs)

Cost of cybercrimes and IPR issues, Web threats for organizations: the evils and Perils, Social media marketing, protecting people privacy in the organizations, Forensic best practices for organizations.

Outcomes:

After completion of this course the student will be able to:

1. Understand the fundamental concepts of computer ethics.
2. Know the linkage between computers, professional, philosophical ethics and decision making.
3. Develop the concepts in computer forensics.
4. Understand how cyber security operations are carried out.
5. Understand the linkage between technology, law and ethics and IT Act.

Text Books:

1. "*Cyber Security*" by Nina Godbole & Sunit Belapure (Wiley India, 2012.) ISBN :978-81-265-2179-1

Reference Books:

2. "*Cyber laws & IT protection*" by Harish Chander (PHI learning pvt. Ltd, 2012). ISBN: 978-81-203-4570-6

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IT 420: ELECTIVE VI

CYBER SECURITY LAB

Teaching Scheme **P: 2**

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Term Work:

1. Instructor will frame 8 programming assignments based on the suggested list of assignments using tools.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practical assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments / Programs.

Learn How to protect your network from cyber Attacks using

1. TCP scanning using NMAP
2. Port scanning using NMAP
3. Web application testing using DVWA
4. Manual SQL injection using DVWA
5. XSS using DVWA
6. Automated SQL injection with SqlMap
7. Phishing
8. Password Cracking
9. Trojan Horse
10. Steganography

11. DoS Attack
12. Buffer Overflow

Practical Examination:

Practical examination will be of 3 hours and it includes performance and viva-voce examination based on the term work.

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IT 421: ELECTIVE VI

E-COMMERCE

Teaching Scheme **L: 4 T: 0**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand various concepts of E-commerce and their types.
2. To learn and understand about client side, server side programming and database connectivity to do business on the web.
3. To provide security to different applications on the web.

Course Contents:

Unit I Introduction and Basic technologies: (10 Hrs)

Electronic commerce and Physical Commerce, different type of e-commerce, some e-commerce scenario, Advantages and disadvantages of e-commerce.

Client side Programming: factors in client side programming, Web page design and production, HTML: overview, structure of HTML documents, Different tags used in HTML, Server Side Programming, Database connectivity, session tracking techniques.

Unit II Internet Security (6Hrs)

IPSec Protocol, Setting up security associations, The Authentication Header (AH) Service, ESP, Preventing Replay attack, Application of IPSec: Virtual Private Network ,Firewalls, Different types of firewalls, Secure Socket layer .

Unit III Advanced Technologies for e-commerce (8Hrs)

Introduction to mobile agents: overview, life cycle of an aglet, **WAP:** model, architecture, benefits, **XML**: HTML and XML, Syntax of XML documents, displaying XML documents, application of XML, and architecture of XML.

Unit IV E-commerce strategies and E-Business (8 Hrs)

Strategies for marketing, Sales and Promotions, Strategies for Purchasing and support activities, Strategies for Web Auctions, Virtual Communities and web portals.

E-Business

E-Business vs E-commerce, Characteristics of e-Business, e-Business role and their challenges, e-business Requirements, impacts of e-business.

Unit V (4 Hrs)

Consumer oriented e-commerce: Traditional vs e-retailing, benefits of e-retailing, success factors, model of e-retailing, features of e-retailing.

Unit VI (4 Hrs)

Business oriented e-commerce: features and models of business

E-services: Categories of e-services, web enabled services, Match making services

Outcomes:

1. Design and implement an e-commerce application with a shopping cart..
2. Integrate user-centered design guidelines in developing user-friendly websites.
3. Analyze real business cases regarding their e-business strategies and transformation processes and choices.

Text Books:

1. "*E-Commerce Fundamentals and application*" by Henry Chan, Raymond Lee, Tharam Dllon, Elizabeth Chang (Student Edition, Wiley-India) ISBN-978-81-265-1469-4.
2. "*Electronics Commerce*" by Gary Schneider (Cengage Learning) ISBN-978-81-315-0533-

Reference Books:

1. '*E- Commerce Strategies, Technology and applications'* BY David Tata McGraw Hill.
2. '*Introduction* to E-commerce' by Jeffrey, Tata, McGraw Hill
3. '*E-Business and Commerce, Strategic Thinking and Practice'* by Brahm, Biztantra.

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IT 421: ELECTIVE VI

E-COMMERCE LAB

Teaching Scheme **P: 2**

Evaluation Scheme	**Continuous Evaluation 30 Marks**	**ESE 70 Marks**	**Minimum Passing Marks 40%**

Term Work:

1. Instructor will frame programming assignments based on the suggested list of assignments.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practical assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments/Programs.

Note: Implement either any eight experiments or Design a web application project based on e-commerce.

1. Create a sample web page for basic text formatting.
2. Design a web page that contains the concepts of lists, links, images, imagemap, tables, frames, forms and CSS.
3. Write a java script code that displays “Java Script Hello World”.
4. Create a web page to implement the concept of form validation for java script.
5. Create a advanced book search engine.
6. Implement the concepts of Hidden form fields.
7. Implement the concepts of Cookies.
8. Implement the concepts of HTTP user authentication.
9. Implement the concepts of URL rewriting.
10. Implement the concepts of JDBC.

Practical Examination: Practical examination will be of 3 hours and it includes performance and viva-voce examination based on the term work.

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IT 422: ELECTIVE VI

WIRELESS SENSOR NETWORKS

Teaching Scheme **L: 4 T: 0**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To understand the concepts of sensor networks, study the architecture and applications of WSN.
2. To discuss the challenges in designing MAC and routing protocols for wireless sensor networks.
3. To study Challenges of Security in Wireless Sensor Networks and Future trends for Security.

Course Contents:

Unit I: Introduction to Wireless Ad Hoc Networks (06 Hrs)
Background of Ad hoc wireless networks, Architecture of Ad Hoc Networks, Application of Ad Hoc sensor networks, Protocols of Ad Hoc Networks, Issues in Ad Hoc wireless networks Comparison between Wireless Ad Hoc and Sensor Networks.

Unit II Layers of Wireless Sensor Network (06 Hrs)
Layers of OSI model, Protocols, Issues in DLL,NL,TL, Network characteristics, Network and Protocol issue, Network topologies, Cross layer approach, clustering in WSN, cluster architecture, Limitation of clustering.

Unit III Wireless Sensors Networks Protocols (08 Hrs)
Medium Access Control Protocols, Routing Protocols, Transport Control Protocols Dissemination protocol for Large sensor Networks, Reliable Transport for Sensor networks.

Unit IV Data Aggregation and Power management in WSN (08 Hrs)
Data aggregation, Areas in aggregation, Techniques in data aggregation, benefits of data aggregation, Power management, factors of energy control, Reasons for energy waste, Energy waste in MAC protocol, Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

Unit V Control Aspect in Sensor Networks (06 Hrs)
Congestion control, Distributed Power Control, Admission Controller Design for High Speed, Networks, Performance evaluation of the Architecture. WSN standards.

Unit VI Security in WSN (06 Hrs)

Issues of security, Impediment of security, Threats in Layers, Intrusion detection, Security requirements and challenges.

Outcomes: Students will be able

1. To understand and study the functionalities, applications and architecture of WSN.
2. To describe the challenges in designing various protocols for wireless sensor networks.
3. To understand the current technology trends for the implementation and deployment of wireless sensor networks.
4. To gain an understanding of WSN Standards and future trends in WSN.
5. To understand security aspects like Privacy issues, attacks and countermeasures

Text Books:

1. "*Wireless Sensor Networks: Technology, Protocols, and Applications*" by Kazem Sohraby, Daniel Minoli, Taieb Znati , Wiley Student Edition. ISBN 13:788126527304

2. *"Sensor Network Operations*" by Shashi Phoha, Thomas LaPorta, Christopher Griffin Publisher: Wiley-Interscience, A John Wiley & Sons, Inc Pub.

Reference Books:

1. "*Wireless Sensor Networks*" by C.S. Raghavendra, Krishna M. Sivalingam and Taieb Znati Publisher: Springer International Edition

2. "*Adhoc Wireless Sensor Networks: Architecture and Protocols*" by C.Sivaramamurthy and B.S.Manoj Publishers: Pearson Education. ISBN-13**:** 978-8131706886.

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IT 422: ELECTIVE VI

WIRELESS SENSOR NETWORK LAB

Teaching Scheme **P: 2**

Evaluation Scheme	**Continuous Evaluation**	**ESE**	**Minimum Passing Marks**
	30 Marks	**70 Marks**	**40%**

Term Work:

1. Instructor will frame programs/assignments based on the above syllabus of IT 422.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practicals / assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Practical Examination: Practical examination will be of 3 hours and it includes performance and / or viva-voce examination based on the term work.

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IT 423: ELECTIVE VI

BIG DATA ANALYTICS

Teaching Scheme **L: 4 T: 0**

Evaluation Scheme	**MSE**	**ESE**	**Minimum Passing Marks**
	20 Marks	**80 Marks**	**40%**

Course Objectives:

1. To familiarize with the basic concepts of big data.
2. To learn how big data helps in analysis of application data.
3. To learn concept of Hadoop, Map Reduce, NoSQL, MongoDB, Cassandra, Hive, and Pig.
4. Develop ability to analyze and process Big Data.
5. Build necessary skills to write Map Reduce programs for analyzing Big Data problems.

Course Contents:

Unit I: Introduction (6 hrs)

Types of Digital Data, Classification of Digital Data, Introduction to Big Data, Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is Big Data?, Other Characteristics of Data Which are not Definitional Traits of Big Data, Why Big Data?, Are We Just an Information Consumer or Do we also Produce Information?, Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment, A Typical Hadoop Environment, What is New Today?, What is changing in the Realms of Big Data?

Unit II: Big Data Analytics (6 hrs)

Where do we Begin?, What is Big Data Analytics?, What Big Data Analytics Isn't?, Why this Sudden Hype Around Big Data Analytics?, Classification of Analytics, Greatest Challenges that Prevent Businesses from Capitalizing on Big Data, Top Challenges Facing Big Data, Why is Big Data Analytics Important?, What Kind of Technologies are we looking Toward to Help Meet the Challenges Posed by Big Data?, Data Science, Data Scientist…Your New Best Friend!!!, Terminologies Used in Big Data Environments, Basically Available Soft State Eventual Consistency (BASE), Few Top Analytics Tools

Unit III: The Big Data Technology Landscape (8 hrs)

NoSQL (Not Only SQL), **Hadoop:** Introducing Hadoop, Why Hadoop?, Why not RDBMS?, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Use Case of Hadoop, Hadoop Distributors, HDFS (Hadoop Distributed File System),

Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator), Interacting with Hadoop Ecosystem.

Unit IV: MongoDB and Cassandra (8 hrs)

MongoDB: What is MongoDB?, Why MongoDB?, Terms Used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language. **Cassandra:** Introduction to Cassandra Apache Cassandra - An Introduction, Features of Cassandra, CQL Data Types, CQLSH, Keyspaces, CRUD (Create, Read, Update and Delete) Operations, Collections, Using a Counter, Time to Live (TTL), Alter Commands, Import and Export, Querying System Tables, Practice Examples.

Unit V: MapReduce, Hive and Pig (8 hrs)

Introduction to MAPREDUCE Programming, Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression. **Hive:** Introduction to Hive, What is Hive?, Hive Architecture, Hive Data Types, Hive File Format, Hive Query Language (HQL), RCFile Implementation, SerDe, User-Defined Function (UDF). **Pig:** Introduction to Pig, What is Pig?, The Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use Case for Pig: ETL Processing, Pig Latin Overview, Data Types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Eval Function, Complex Data Types, Piggy Bank, User-Defined Functions (UDF), Parameter Substitution, Diagnostic Operator, Word Count Example using Pig, When to use Pig?, When not to use Pig?, Pig at Yahoo!, Pig versus Hive.

Unit VI: Jasper Soft (4 hrs)

Jasper Report using Jasper soft: Introduction to Jasper Reports, Connecting to MongoDB NoSQL Database, Connecting to Cassandra NoSQL Database, Introduction to Machine Learning, Machine Learning Algorithms.

Outcomes: Student will be able

1. To identify need for Big Data analysis.
2. To understand concepts of Hadoop, MapReduce, NoSQL, MongoDB, Cassandra, Hive, and Pig
3. To analyze and identify Big data processing technology for analyzing the Big data.
4. To write Map Reduce programs to process Big Data by identifying the use case.

Text Books:

1. "*Big Data and Analytics*" by Seema Acharya, Subhashini Chellappan, Infosys Limited, Wiley India Private Limited, 1st Edition 2015. ISBN 13: 9788126554782.
2. "*Hadoop: The Definite Guide*" by Tom White, O' Reilly, 3rd Edition.
3. "*Big Data, Black Book*" by DT Editorial Services, Wiley India Pvt. Ltd. ISBN 13: 9789351197577.

Reference Books:

1. "*Big Data for Dummies***"** by Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman ,Wiley & Sons India.
2. "*Hadoop in Action*" by Chuck Lam, Dreamtech Press, ISBN : 978-81-7722-813-7.
3. "*Programming Hive*" By Edward Rutherglen, Dean Wampler, Jason Rutherglen, Edward Capriolo. - O'reilly Media.
4. "*The Definitive Guide to MongoDB: A Complete Guide to Dealing with Big Data Using MongoDB*" (Definitive Guide Apress) 2e by David Hows, Eelco Plugge, Peter Membrey, Tim Hawkins.
5. "*Programming Pig*" by Alan Gates - O'reilly Media.
6. "*Cassandra: The Definitive Guide*" by Eben Hewitt - O'reilly Media.
7. "Jaspersoft : Reports Ultimate Guide" 3e. (e-Resource)
8. "*Making Sense of NoSQL" – A guide for managers and the rest of us*" by Dan McCreary and Ann Kelly Manning Press.

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IT 423: ELECTIVE VI

BIG DATA ANALYTICS LAB

Teaching Scheme	**P: 2**		
Evaluation Scheme	**Continuous Evaluation 30 Marks**	**ESE 70 Marks**	**Minimum Passing Marks 40%**

Term Work:

1. Instructor will frame 8 programs/assignments based on the suggested list of experiment.
2. Instructor is expected to incorporate variations in list.
3. Students will submit term work in the form of a journal that will include at least 8 practicals / assignments.

The assessment will be based on the following –

1. Performance in the practical examination.
2. Record of programs submitted by the candidate.
3. Innovation & Creativity.
4. Team building skills.
5. Technical writing skills.

Suggested list of Experiments /Practicals:

1. Study and Configure Hadoop for Big Data.
2. Study of NoSQL Databases such as Hive/Hbase/Cassendra/DynamoDB.
3. Design Data Model using- Hive
4. Design Data Model using – Hbase
5. Design Data Model using – Cassendra
6. Design Data Model using -DynamoDB.
7. Design Persistent Objects using JDO and implement min 10 queries on objects using JDOQL in ObjectDB NOSQL DATABASE.
8. Design database schemas and implement min 10 queries using Hive.
9. Design database schemas and implement min 10 queries using Hbase.
10. Design database schemas and implement min 10 queries using Cassendra.
11. Design database schemas and implement min 10 queries using DynamoDBkeyValue based database.
12. Implement machine learning algorithm for classification task in BIG data Analytics.
13. Implement machine learning algorithm for clustering task in BIG data Analytics.

14. Design and Implement social web mining application using NoSQL databases, machine learning algorithm, Hadoop and Java/.Net

Practical Examination: Practical examination will be of 3 hours and it includes performance and/or viva-voce examination based on the term work.

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IT 424.

WEB TECHNOLOGY LAB III

Teaching Scheme **L:2 P:2**

Evaluation Scheme	Continuous Evaluation	ESE	Minimum Passing Marks
	30 Marks	70 Marks	40%

Course Objectives:

1. To learn programming in C# and dot NET framework.
2. To develop web applications using C# and dot NET framework.

Course Contents:

Unit I **(5 Hrs)**

Introduction to C#:

Introducing C#, Understanding .NET, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations.

Unit II **(5 Hrs)**

Object Oriented Aspects of C#:

Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.

Unit III **(5 Hrs)**

Application development on. NET:

Building Windows Applications, Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, PictureBoxes,ToolTips,Mouse-Event Handling, Keyboard-Event Handling, Menus and various controls,Accessing Data with LINQ and ADO.NET.

Unit IV **(5 Hrs)**

Web based application development on dot NET:

Programming Web Applications with Web Forms, Validation Controls, Session Tracking and Accessing data with ADO.NET, Web Services.

Course Outcomes:

After completion of this course student should be able to

1. Design console application and windows application.
2. Design web application.

Text Book:

1. "*Programming in C#:A Primer"* by E. Balagurusamy, Tata McGraw Hill Publication. ISBN: 978-0-070-70207-3.
2. "*Programming C#"* by J. Liberty, O'Reilly Publication 2nd Edition. ISBN: 978-0-596-00309-8

Reference:

1. "*The Complete Reference: C#" by* Herbert Schildt, Tata McGraw Hill Publication. ISBN: 978-0-070-70368-1.

Term Work

- Instructor will frame 10 programs based on the suggested list of experiments/programs.
- Students will submit Term Work in the form of a journal that will include at least 10 programs. Each program will consist of pseudo algorithm, program listing with proper documentation and printout of the output.
- The assessment will be based on the following –
    1. Performance in the practical examination
    2. Record of programs submitted by the candidate.
    3. Setting goals higher than expected from problem statement
    4. Innovation & Creativity.
    5. Team building skills
    6. Technical writing skills

Suggested list of Experiments/Programs:

1) Write a simple program using C#.
2) Write a program for array operations.
3) Write a program using for loop.
4) Write a program for unary & binary operations.
5) Write a program to demonstrate inheritance.
6) Write a program to demonstrate polymorphism (overloading & overriding).
7) Write a program for introduction to delegate.
8) Write a program using event handling.
9) Write a program to demonstrate exception handling.
10) Write a program for data accessing via ADO.Net using connected architecture.

11) Write a program for data accessing via ADO.Net using disconnected architecture.

12) Create a web application using windows form.

13) Describe structure of .NET Framework.

14) Describe working of CLR.

Practical Examination: Practical examination will be of 3 hours and it includes performance and viva-voce examination based on the term work.

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IT 425.
PROJECT- II

Teaching Scheme **P: 4**

Evaluation Scheme	**Continuous Evaluation**	**ESE**	**Minimum Passing Marks**
	50 Marks	**50 Marks**	**40%**

Evaluation criteria

The continuous evaluation of term work shall be of 50 Marks. The 45 Marks shall be distributed over 03 internal assessments / reviews during the semester by a review committee. The remaining 05 Marks shall be distributed for attendance.The Head of the department shall constitute the review committee. The student shall make a presentation on the progress made before the committee. The 50 Marks of the practical will be awarded based on the performance in the practical examination conducted by the University at the end of the semester.

General suggestions and expectations / guidelines

1. A different projects can be done in Semester VIII **OR** the same project of the Semester VII can be continued depending on the scope of the project and prior approval from the Head of Department.
2. Project work must be carried out by the group of **at most three** students and in special case four (subject to approval by HOD) , who will jointly work and implement the project. **The work must be original**.
3. To proceed with the project work it is very important to select a right topic. Project can be undertaken on any subject addressing Information Technology / any subject studied in previous semesters. Research and development projects on problems of practical and theoretical interest should be encouraged.
4. Project shall be any one of the following:
    - Creation of software, hardware or middleware related to Information Technology/Computer Engineering/Inter-disciplinary Technologies.

- Fabrication of devices preferably those devices energized from converging technologies .
- Creation of experimental setup and experimentation based on technological literature in the public domain .

5. Students should submit the Project Topic along with Project Abstract and Team Members details for the approval. Project Topic Must be approved by HOD and Project Coordinator.
6. The project work can be undertaken in a research institute or organization / company / any business establishment after taking prior approval of HOD.
7. Before Implementation students must submit the project documentation in the form of SRS (i.e. System Specification Requirements) that includes:
    - System Details
    - Data Model (If Back End is used) /ER Diagrams /DFD and UML diagrams.
    - Module Description
    - Module allocation to every team member
8. Even though project is a Group Activity, still it needs contribution of every team member as an individual; hence each team member must equally contribute in implementation of project.
9. Project Report format will be decided by Project Coordinator and same should be followed by the students.
10. Student must submit Project report at least 2 weeks before the end of semester.
11. **If a project is found to be Purchased/Downloaded/Copied, it will be rejected at any stage and the team will be penalized or declared failed as decided by the examiners.**
12. If a **one semester project** is undertaken then :

    (a) For Project I : The group should complete the Project-I in Semester VII only and prepare a project report in **Spiral Bound** which contains following details:- Abstract, Project overview, Problem Statement, Requirement Analysis, Project design, Implementation Details, Technologies used, Results, Conclusion and References.

    (b) For Project II : The group will submit the name of the New Project with a synopsis of the proposed work in not more than 03 to 08 pages. The group will submit a final **Hardbound** project report at the end of VIII semester as per specified format.
13. If a **two semester project** is undertaken then :

For Project I : The group will submit the name of the project with a synopsis of the proposed work in not more than 03 to 08 pages. The group should complete detail system analysis and design, data flow design, data structure layout, file design, Procurement of Hardware and/or software requirements, and partial implementation of the project in Semester VII. The group should prepare a **Spiral Bound** project report containing the work carried out in Semester VII and Implementation Plan for Semester VIII at the end of the Semester VII as a part of the term work submission.

For Project II : The group will continue to work on the project selected during the Semester VII and submit a final **Hardbound** project report at the end of Semester VIII containing Complete Implementation of the Project with results, conclusion and future work as per specified format.