Semester III

Paper Code	Course	Total Theory Credits	Total Practical Credits	Internal	External	Total
CSC412	Programming 3	3	2	20	80	100
CSC413	Compiler Design	3	2	20	80	100
CSC414	Computer Graphics	3	2	20	80	100
CSC441 - 450	Elective 3	3	2	20	80	100
CSC451 - 460	Elective 4	3	2	20	80	100
CSC415	Service Course/Audit Group	4	-	20	80	100
		19	10			

Practical Code

CSC470 Practical based on CSC412,

CSC471 Practical based on CSC413, CSC472 Practical based on CSC414 CSC446 - 450 Practical based on CSC441-445, CSC455-460 Practical based on CSC451-460

Detailed Syllabus of Courses under Semester III

Course Code	CSC412	Course title	Programming 3
Number of Credits	3	Internal / External	20/80
Total Contact Hours (Th)	3Hrs/week	Total Contact Hours (Pr)	-

Prerequisite: The student (s) should holds good skills on functional programming concepts, fundamental object oriented concepts. Student(s) should select either group prior so that there are of expertise nurtured by the department by providing them training on the selected platform. The effort were taken towards providing horizontal specialization/technical skill in the programming group offered to the student in the semester I. It is advised to student to select the specialized learning path of the group selected in semester I for semester II and semester III also.

Objective: the objective of this paper is to

- Provide student an opportunity to learn and develop basic skills required in writing programs in advanced framework.
- Student will be provided horizontal learning path where they will be able to select the technology trends such as Java Group, Microsoft Group, and Open System Group.
- Programming 3 will help student to learn advance technology and apply this technology for building useful applications.
- Student will be able to write programs for generating solutions.

Course Outline

A)Android

Unit 1: Introduction: Introduction to Android, Setting up development environment, Dalvik Virtual Machine

& .apk file extension, Fundamentals- Basic Building blocks - Activities, Services, Broadcast Receivers & Content providers, UI Components - Views & notifications, Components for communication -Intents &

Intent, Filters, Android API levels (versions & version names), Application Structure - AndroidManifest.xml,

Uses-permission & uses-sdk Resources & R.java, Assets, Layouts & Drawable Resources, Activities and Activity lifecycle, First sample Application

Unit 2: Android Virtual Device: Emulators, Launching emulator, Editing emulator settings, Emulator shortcuts, Logcat usage, Introduction to DDMS, Hello World App, Creating your first project, The manifest file, Layout resource, Running your app on Emulator, Second App:- (switching between activities) Develop an app for demonstrating the communication between Intents. Form widgets, Text Fields, Layouts, [dip, dp, sip, sp] versus px, Preferences - Shared Preferences, Preferences from xml, Examples, Menu - Option menu, Context menu, Sub menu, menu from xml, menu via code.

Unit 3: Intents and UI Designs: Explicit Intents and Implicit intents, Time and Date, Images and media, Composite, Alert Dialogs & Toast, Popup, Tabs & Tab Activity, Styles & Themes, styles.xml, drawable resources for shapes, gradients (selectors), style attribute in layout file, Applying themes via code and manifest file. Adapter and Widgets: - Adapters - ArrayAdapters & BaseAdapters, ListView and ListActivity, Custom listview, GridView using adapters, Gallery using adapters. Notifications - Broadcast Receivers, Services and notifications, Toast, Alarms.

Unit 4: Custom Components, Threads & Services – Custom tabs, custom animated popup panel, other components, Threads - Threads running on UI thread (runOnUiThread), Worker thread, Handlers & Runnable, AsynTask (in detail), Services - Overview of services in Android, Implementing a Service, Service lifecycle, Inter Process Communication (AIDL Services), Location based services and Maps - Using Location Based Services, Finding current location and listening for changes in location, Proximity alerts, Working with Google Maps, Showing google map in an Activity, Map Overlays, Itemized overlays, Geocoder, Displaying route on map.

Unit 5: Content Providers - SQLite Programming, SQLiteOpenHelper, SQLiteDatabse, Cursor, Reading and updating Contacts, Reading bookmarks. Sensors – basics, Using Orientation and Accelerometer sensors, Best practices for performance, Telephony Services - Making calls, Monitoring data connectivity and activity, Accessing phone properties and status, Controlling the phone, Sending messages. Camera - Taking pictures, Media Recorder, Rendering previews. Bluetooth - Controlling local Bluetooth device, Discovering and bonding with Bluetooth devices, Managing Bluetooth connections, communicating with Bluetooth.

Books

- Professional Android 2 Application Development by Reto Meier, WROX Programmar to Programmar series
- Android Programing for Beginners, John Horton, PACKT open source publications Android Programing The Big Nerd Rench Guide, 3rd Edition.

References:

- https://developer.android.com/
- Documentation https://developer.android.com/docs/
- Samples https://developer.android.com/samples/

B)C#. NET

Unit 1: DOTNET Framework: Introduction to DOTNET, DOT NET class framework, Common Language Runtime – Overview, Elements of .NET application, Memory Management, Garbage Collector : Faster

Memory allocation, Optimizations, Common Language Integration, Common type system, Reflection API, User and Program Interface

Unit 2: Introduction to C#: Language features, Variables and Expressions, type conversion, Flow Control, Functions, Delegates, Debugging and error handling, exception handling (System Defined and User Defined), Object Oriented Concepts, Defining classes, class members, Interfaces, properties, . Access modifiers, Implementation of class, interface and properties, Concept of hiding base class methods, Overriding, Event Handling, Collections, Comparisons and Conversions, Defining and using collections, Indexers, iterators. Type comparison, Value Comparison. Overloading Conversion operators, as operator. Generics- Using generics, Defining Generics, generic Interfaces, Generic methods, Generic Delegate, Arrays – Single Dimensional, Multi Dimensional, Jagged Array, Implicitly typed Array

Unit 3: Window Programming: Window Controls, Common Controls, Container Controls, Menus and Toolbars, Printing, Dialogs, Deploying Window Application - Deployment Overview, Visual studio setup and Deployment project types, Microsoft windows installer architecture, Building the project : Installation

Unit 4: Database Programming using C#: Data Access, File System Data, XML, Databases and ADO.NET - Data Binding, Web Programming, Basic Web programming, Advanced Web programming, Web Services, Deployment Web applications,

Unit 5: NET Assemblies – Components, NET Assembly features, Structure of Assemblies, Calling assemblies, private and shared assemblies, Networking - Networking overview, Networking programming options, Webclient, WebRequest and WebResponse, TcpListener &TcpClient, Introduction to GDI+ - Overview of Graphical Drawing, Pen Class, Brush Class, Font Class, Using Images, Clipping, Drawing2D, Imaging.

Books

- Beginning Visual C#, Wrox Publication
- Professional Visual C#, Wrox Publication
- Inside C#, by Tom Archer ISBN: 0735612889 Microsoft Press Â© 2001, 403 pages

Web References

- https://docs.microsoft.com/en-us/dotnet/csharp/programming-guide/
- C# Guide https://docs.microsoft.com/en-us/dotnet/csharp/
- Web Application C# https://msdn.microsoft.com/en-IN/library/dd492132.aspx

C)Open Web Programming

Unit 1: Introduction to Web Programming: Introduction, Creating a Website, Web Page Example ,HTML Tags, Structural Elements, title Element, meta Element, HTML Attributes, body Elements: hr, p, br, div, Cascading Style Sheets Preview, History of HTML, HTML Governing Bodies, Differences Between Old HTML and HTML, How to Check Your HTML Code, Case Study: History of Electric Power.

Unit 2:Coding Standards, Block Elements, Text Elements, and Character References, Introduction, HTML Coding Conventions, Comments, HTML Elements Should Describe Web Page Content Accurately, Content Model Categories, Block Elements, blockquote Element, Whitespace Collapsing, pre Element, Phrasing Elements, Editing Elements, q and cite Elements, dfn, abbr, and time Elements, Code-Related Elements, br and wbr Elements, sub, sup , s , mark , and small Elements, strong, em, b, u, and i

Elements, span Element, Character References, Web Page with Character References and Phrasing Elements, Case Study: A Local Hydroelectric Power Plant.

Unit 3: Cascading Style Sheets (CSS): Introduction, CSS Overview, CSS Rules, Example with Type Selectors and the Universal Selector, CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, CSS Properties, Color Properties, RGB Values for Color, Opacity Values for Color, HSL and HSLA Values for Color, Font Properties, line-height Property, Text Properties, Border Properties, Element Box, padding Property, margin Property, Case Study: Description of a Small City's Core Area.

Unit 4: Organizing a Page's Content with Lists, Figures, and Various Organizational Elements: Introduction, Unordered Lists, Descendant Selectors, Ordered Lists, Figures, Organizational Elements, Section, article, and aside Elements, nav and a Elements, header and footer Elements, Child Selectors, CSS Inheritance, Case Study: Microgrid Possibilities in a Small City, **Tables and CSS Layout:** Introduction, Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo-Class Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, Absolute Positioning with CSS Position Properties, Relative Positioning, Case Study: A Downtown Store's Electrical Generation and Consumption.

Unit 5: Introduction to JavaScript: Functions, DOM, Forms, and Event Handlers, Introduction, History of JavaScript, Hello World Web Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects, Document Object Model, Forms and How They're Processed: Client-Side Versus Server-Side, form Element, Controls, Text Control, Email Address Generator Web Page, Accessing a Form's Control Values, reset and focus Methods, Comments and Coding Conventions, Event-Handler Attributes, onchange, onmouseover, onmouseout, Using noscript to Accommodate Disabled JavaScript.

Text Book

- John Dean (2019), Web Programming with HTML5, CSS, and JavaScript, Jones & Bartlett Learning, LLC, an Ascend Learning Company, Burlington, MA 01803.

Course Code	CSC414	Course title	Compiler Design
Number of Credits	3	Internal / External	20/80
Total Contact Hours (Th)	3Hrs/week	Total Contact Hours (Pr)	-

Course Objective:

- Introducing students to the concepts and principles of compiler design.
- Providing students with basic understanding of grammars and language definition.
- Introducing students to the various phases of designing a compiler.
- Introducing students to the various programming techniques and structures used in compiler construction.
  - Providing students with practical programming skills necessary for constructing a compiler.

Prerequisite:

Knowledge of automata theory, context free languages, computer architecture, data structures and simple graph algorithms, logic or algebra.

At Course Completion:

Fluency in describing the theory and practice of compilation, in particular, the lexical analysis, syntax, and semantic analysis, code generation and optimization phases of compilation. Ability to create lexical rules and grammars for a programming language

Course Outline Unit-1:

Introduction:

Translator Issues, why to write a Compiler, what is a Compiler, what is the Challenge, Compiler Architecture, Front end and Back end model of compiler, Cross compiler, Incremental compiler, Boot strapping, Lexical Analysis: Concept of Lexical Analysis, Regular Expressions, Deterministic finite automata (DFA), Non-Deterministic finite automata (NFA), Converting regular expressions to DFA, Converting NFA to DFA, Hand coding of Lexical analyzer, Introduction to LEX Tool and LEX file specification, Error detection and recovery in LEX.

Unit-2:

Syntax Analysis:

Context Free Grammars(CFG), Concept of parsing, Parsing Techniques, Top-Down Parsers: Introduction, Predictive Parsing - Removal of left recursion, Removal of left factoring, Recursive Descent Parsing, Predictive LL(k) Parsing Using Tables, Bottom Up parsing: Introduction, Shift-Reduce Parsing Using the ACTION/GOTO Tables, Table Construction, SLR(1), LR(1) and LALR(1) Grammars, Practical Considerations for LALR(1) Grammars, Introduction to YACC Tool & YACC file specification, Error detection and recovery in YACC.

Unit-3: Semantic Analysis

Need of semantic analysis, Abstract Parse trees for Expressions, variables, statements, functions and class declarations, Syntax directed definitions, Syntax directed translation schemes for declaration processing, type analysis, scope analysis, Symbol Tables (ST),Organization of ST for block structure and non-block structured languages, Symbol Table management, Type Checkers: type checking for expressions, declarations (variable, type, function, recursive), statements,

Unit-4 Intermediate code generation: Intermediate languages, Design issues, Intermediate representations: three address, postfix & abstract syntax trees, Intermediate code generation for declaration, assignment, iterative

statements, case statements, arrays, structures, conditional statements, Boolean expressions, procedure/function definition and call.

Unit-5:

Run-Time Memory Management & Code generation:

Model of a program in execution, Stack and static allocation, Activation records, Issues in the design of code generation, Target machine description, Basic blocks & flow graphs, Expression Trees, Unified algorithms for instruction selection and code generation, Sethi Ullman algorithm for expression trees, Aho Johnson algorithm, Different models of machines , order of evaluation, register allocation, Code generator-generator concept .

Text Books:

- Alfred V. Aho, A. V. R. Sethi and J.D. Ullman "Compiler Principle, Techniques and Tools" Addison Wesley.

Reference Books:

- Barrent W. A., J. D. Couch, "Compiler Construction Theory and Practice", Computer Science series, Asian student edition.
- Dhamdhere D.M., "Compiler Construction Principle and Practice", Mac. Millan India, New Delhi.
  Manish Kumar Jhas, "Compiler Construction –An advance course".
- Ravendra Singh, Vivek Sharma, Manish Varshney, "Design and Implementation of Compiler", New Age Publications.
- Holub, A.J., "Compiler design in C" –Prentice Hall.
- John Levine, Tony Mason & Doug Brown, "Lex and Yacc", O Reilly

Course Code	CSC414	Course title	Computer Graphics
Number of Credits	3	Internal / External	20/80
Total Contact Hours (Th)	3Hrs/week	Total Contact Hours (Pr)	-

Prerequisites: student must have good programming skills and System-Level Programming, or equivalent C programming experience.

Course Description: This course introduces fundamental concepts of computer graphics with an emphasis on interactive real-time graphics techniques. The focus is on 3D graphics programs using OpenGL. Basic C programming is required for this course. The course focuses on 3D graphics, and focus on model creation and 3D animation using OpenGL.

Course Objectives: By the end of the semester students are expected to have a general understanding of the following:

- Transformations, camera manipulation, frame buffer operations, etc.
- The basics of lighting and shading, texture mapping.
- The fundamentals of modelling and animation.
- The fundamentals of 3D graphics pipeline
- The current state of the art in computer graphics and expected near term advances.
- In the end, students will be able to develop relatively sophisticated 3D graphics programs.

Computer Graphics (Sem-III)

Unit I:

An Invitation to Computer Graphics: brief history of computer graphics, overview of graphics system. input devices, output devices, display types: random scan and raster scan, definitions: pixel, resolution, aspect ratio, aliasing and anti-aliasing, application of computer graphics. Theory of Transformation: Geometric Transformations in 2-Space, Affine Transformations, Geometric Transformations in 3-Space,

Unit II:

Convexity And Interpolation: Motivation , Convex Combinations, Interpolation, Convexity And The Convex Hull. Raster Algorithms : Dda And Bresenham's Line Rasterizers, Cohen-Sutherland Line Clipper, Sutherland-Hodgman Polygon Clipper, Scan-Based Polygon Rasterizer. Modeling In 3d Space: Curves, Specifying Plane Curves, Specifying Space Curves, Drawing Curves , Surfaces , Polygons , Swept Surfaces ,

Unit III:

Anatomy of Curves and Surfaces: Bezier Curves, Linear Bezier Curves, Quadratic Bezier Curves, Cubic Bezier Curves, General Bezier Curves . Bezier Surfaces, Problems with Bezier Primitives, Motivating B-Splines , B-Spline Curves, Spline Curves, First-Order B- Splines , Cubic B-Splines , General B-Splines and Non-uniform Knot Vectors.

Unit IV:

Color And Light: Vision And Color Models, RGB Color Model , CMY And CMYK Color Models , HSV Color Model, Phong's Lighting Model , Phong Basics, Specifying Light And Material Values , Calculating The Reflected Light , First Lighting Equation , Texture : Basics,

Texture Space, Coordinates And Map, Blending Theory , Opaque And Translucent Objects Together , Blending Textures, Bump Mapping, Shadow Mapping.

Unit V:

Fractals, Animation : Animation Technicals , Animation Code , Simple Orthographic Shadows, Selection And Picking, Advanced Animation Techniques: Frustum Culling By Space Partitioning , Space Partitioning, Occlusion , Conditional Rendering. Pipeline Operation: Ray Tracing Pipeline, Radiosity.

References:

1. Sumanta Guha, Computer Graphics Through OpenGL From Theory to Experiments, 3rd Edition, CRC Press, Taylor & Francis group, 2019.
2. Dave Shreiner, et al, OpenGL Programming Guide_ The Official Guide to Learning OpenGL, Version 4.3. 8th Edition, 2013.
3. D. Hearn and M. Pauline Baker, Computer Graphics (C Version), Pearson Education, 2nd Edition, 2004.
4. D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, 2nd Edition, McGraw-Hill International Edition, 1990.

Course Code	CSC441-450	Course title	Elective 3
Number of Credits	3	Internal / External	20/80
Total Contact Hours (Th)	3Hrs/week	Total Contact Hours (Pr)	-

1.CSC 441 – Pattern Recognition

Prerequisite: student should have prior knowledge of probabilities and statistics as well as good programming skills.

About Course

Pattern recognition techniques are concerned with the theory and algorithms of putting abstract objects, e.g., measurements made on physical objects, into categories. Typically the categories are assumed to be known in advance, although there are techniques to learn the categories (clustering). Methods of pattern recognition are useful in many applications such as information retrieval, data mining, document image analysis and recognition, computational linguistics, forensics, biometrics and bioinformatics

Course Outline

Unit-1: Basics of Probability, Random Processes and Linear Algebra (recap): Probability: independence of events, conditional and joint probability, Bayes theorem Random Processes: Stationary and non-stationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra. Linear Algebra: Inner product, outer product, inverses, eigen values, eigen vectors, singular values, singular vectors.

Unit-2: Bayes Decision Theory: Minimum-error-rate classification. Classifiers, Discriminant functions, Decision surfaces. Normal density and discriminant functions. Discrete features.

Unit-3: Parameter Estimation Methods: Maximum-Likelihood Estimation: Gaussian case. Maximum a Posteriori estimation. Bayesian estimation: Gaussian case. Unsupervised learning and clustering - Criterion functions for clustering. Algorithms for clustering: K-Means, Hierarchical and other methods. Cluster validation. Gaussian mixture models, Expectation-Maximization method for parameter estimation. Maximum entropy estimation. Sequential Pattern Recognition. Hidden Markov Models (HMMs). Discrete HMMs. Continuous HMMs. Nonparametric techniques for density estimation. Parzen-window method. K-Nearest Neighbour method.

Unit-4: Dimensionality reduction: Principal component analysis - it relationship to eigen analysis. Fisher discriminant analysis - Generalised eigen analysis. Eigen vectors/Singular vectors as dictionaries. Factor Analysis, Total variability space - a dictionary learning methods. Non negative matrix factorization - a dictionary learning method. Linear discriminant functions: Gradient descent procedures, Perceptron, Support vector machines - a brief introduction.

Unit-5: Artificial neural networks: Multilayer perceptron – feed forward neural network. A brief introduction to deep neural networks, convolutional neural networks, recurrent neural networks. Non-metric methods for pattern classification: Non-numeric data or nominal data. Decision trees: Classification and Regression Trees (CART).

Text Books:

- K. P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
- C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
- R. O. Duda, P. E. Hart, D. G. Stork, Pattern Classification, 2nd edition, John Wiley & Sons, Inc., 2000.
- S. Theodoridis, K. Koutroumbas, Pattern Recognition, 3rd edition, Academic Press, 2006.
- D. Koller, N. Friedman, Probabilistic Graphical Models: Principals and Techniques, MIT Press, 2009.
- Webb, Statistical Pattern Recognition, 2nd edition, John Wiley & Sons, Inc., 2002.
- T. Hastie, R. Tibshirani, J. Friedman, The Elements of Statistical Learning, Springer, 2003.
- K. Fukunaga, Introduction to Statistical Pattern Recognition, Academic Press, 1990.
- R. Schalkoff, Pattern Recognition: Statistical, Structural and Neural Approaches, John Wiley & Sons, Inc., 1992.
- K. Jain, R. C. Dubes, Algorithms for Clustering Data, Prentice Hall, 1988.

Web Link:

- https://www.cse.iitm.ac.in/course_details.php?arg=Mjc=
- https://www.isip.piconepress.com/courses/temple/ece_8527/syllabus/current/

2.CSC 442 – Data Warehousing

Prerequisite: Student must have good knowledge of relational databases, database processes and different architecture of databases etc.

Course Description: This is the course in the Data Warehousing for Business Intelligence specialization. Ideally, the courses should be taken in sequence. In this course, you will learn exciting concepts and skills for designing data warehouses and creating data integration workflows. These are fundamental skills for data warehouse developers and administrators. You will have hands-on experience for data warehouse design and use open source products for manipulating pivot tables and creating data integration workflows. You will also gain conceptual background about maturity models, architectures, multidimensional models, and management practices, providing an organizational perspective about data warehouse development. If you are currently a

business or information technology professional and want to become a data warehouse designer or administrator, this course will give you the knowledge and skills to do that.

Couse Outcome: By the end of the course, you will have

- The design experience, software background, and organizational context that prepares you to succeed with data warehouse development projects.
- Student will be able to create data warehouse designs and data integration workflows that satisfy the business intelligence needs of organizations.
- Evaluate an organization for data warehouse maturity and business architecture alignment;
- Create a data warehouse design and reflect on alternative design methodologies and design goals;
- Create data integration workflows using prominent open source software;
- Reflect on the role of change data, refresh constraints, refresh frequency trade-offs, and data quality goals in data integration process design;
- Perform operations on pivot tables to satisfy typical business analysis requests using prominent open source software

Course Outline

Unit-1: Data Warehouse Concepts and Architectures: introduction of data warehousing, historical reasons for development of data warehouse technology, learning effects, business architectures, maturity models, project management issues, market trends.

Unit-2: Multidimensional Data Representation and Manipulation: multidimensional representation of a data warehouse used by business analysts. You'll apply what you've learned in practice and graded problems using Pivot4J, an open source tool for manipulating pivot tables. At the end of this module, you will have solid background to communicate and assist business analysts who use a multidimensional representation of a data warehouse.

Unit-3: Data Warehouse Design Practices and Methodologies: This module emphasizes data warehouse design skills. Now that you understand the multidimensional representation used by business analysts, you are ready to learn about data warehouse design using a relational database. In practice, the multidimensional representation used by business analysts must be derived from a data warehouse design using a relational DBMS. You will learn about design patterns, summarizability problems, and design methodologies. You will apply these concepts to mini case studies about data warehouse design. At the end of the module, you will have created data warehouse designs based on data sources and business needs of hypothetical organizations.

Unit-4: Data Integration Concepts, Processes, and Techniques: This Unit extends your background about data warehouse development. After learning about schema design concepts and practices, you are ready to learn about data integration processing to populate and refresh a data warehouse. The informational background in this unit covers concepts about data sources, data integration processes, and techniques for pattern matching and inexact matching of text. This unit provides a context for the software skills that you will learn in next Unit.

Unit-5: Architectures, Features, and Details of Data Integration Tools, this unit extends your background about data integration from unit-4. This unit covers architectures, features, and details about data integration tools to complement the conceptual background in unit-4. You will learn about the features of two open source data integration tools, Talend Open Studio and Pentaho Data Integration. You will use Pentaho Data Integration in guided tutorial in preparation for a graded assignment involving Pentaho Data Integration.

References:

- Data Warehousing Fundamentals, Paulraj Ponniah, John Wiley & Sons, 2006, ISBN 8126509198, 9788126509195
- Data Warehousing by Paperback, Bpb Publications, 15 November 2004, ISBN-10: 8176569283, ISBN-13: 978-8176569286

Web Link:

- https://www.coursera.org/learn/dwdesign
- http://www.iisastr.com/datawarehousing.html

3.CSC 443 – Remote Sensing

Course Pre-requisite: Theoretical and Practical knowledge of Digital Image processing and Remote Sensing is required.

Course Objectives:

- Interpretation and analysis of remotely sensed data.
- Understanding the various algorithms of digital image analysis and its accuracy assessment.
- Enhancing the students understanding in terms of data handling and quality.

Course Outcomes:

- Appraise the degree to which remote sensing data can be used efficiently and effectively.
- Student can able to classify, analyze and assess the remotely sensed data and able to design and develop remote sensing data analysis for various applications.
- Ability to develop the problem solving and research skill in this domain.

Course Outline

Unit 1 Sources and Characteristics of Remote Sensing Image Data: Introduction to Data Sources, Remote Sensing Platforms, Image Data Sources in the Microwave Region, Spatial Data Sources in General, A Comparison of Scales in Digital Image Dara.

Unit 2 Error Correction and Registration of Image Data: Sources of Radiometric Distortion, Corrections of Radiometric Distortion, Sources of Geometric Distortion, Corrections of Geometric Distortion, Image Registration.

Unit 3 Interpretation of Digital Image Data: Approaches to Interpretation, Forms of Imagery for Photointerpretation, An Introduction to Quantitative Analysis-Classification, Multispectral Space and Spectral Classes.

Unit 4 Classification: Pixel Vector and Labelling, Unsupervised Classification, Supervised Classification.

Unit 5 Accuracy Assessment: Relevance of Validating Results, Methods to Estimate Accuracy, Sources of Error, Sampling Design, Gathering Information, Measuring Error in Interval-Scale variables, Measuring Error in Classified Images, Verification of Multi-temporal Analysis.

Text Books:

- Remote sensing Digital image Analysis An Introduction, John A. Richards, Xiuping Jia
- Canty, M. J. (2014). Image analysis, classification and change detection in remote sensing: with algorithms for ENVI/IDL and Python. CRC Press.
- Digital Analysis of Remotely sensed Imagery, Jay Gao, McGraw Hill

Web Resources:

- http://www.isro.org/
- http://www.nrsc.co.uk/
- http://www.rspsoc.org/
- http://www.ccrs.nrcan.gc.ca/index_e.php
- http://rst.gsfc.nasa.gov/start.html
- http://www.usgs.gov

4.CSC 444 – Micro Controller Programming

Prerequisite: student must be aware with assembly level language, good programming skill on C

Course Description

This course is designed to provide an introduction to microcontroller assembly language programming. Students will be taught the basic use of a programming environment and how to convert the basic elements of the C programming language (including loops, control statements, and arrays) into a well-formed assembly language program. This course also highlights the general computer science concepts such as operating systems, computer organization, data representation, low-level input/output, and memory usage in the microcontroller environment. A program will also be written in C to emphasis the difference between microcontrollers and microprocessors.

Course Objectives

- Program microcontrollers with the C programming language.
- Use timer peripherals
- Use communication peripherals
- Use analog-to-digital converter peripherals
- Use a liquid crystal display (LCD)

Course Outcome

- Student will be able to independently work on Embedded System with 8051 and PIC Microcontrollers
- Electronic system design with 8051 microcontrollers
- Electronic system design with PIC microcontrollers
- Embedded Coding with 8051 microcontrollers

Couse Outline

Unit 1: Introduction to embedded systems, scope and use, examples of embedded systems - embedded applications, introduction to embedded C Programming with different tools

Unit 2: 8051 Architectures - block diagram, 8051 family microcontrollers, their peripherals - timers, interrupts, ports.

Unit 3: Interfacing with peripheral devices - LCD, keyboard, stepper motors etc

Unit 4: Introduction to PIC microcontrollers - PIC Architecture, family of PIC microcontrollers, Embedded C programming for PIC microcontrollers with MPLab

Unit 5: PIC Peripherals - Timers, Interrupts, ADC, Serial ports, LCD, Keyboards, and working with stepper motors

Recommended Hardware

- 8051 Microcontroller Kits
- PIC Development Kits
- PC, Interfacing boards
- Electronic components for assembly

Software's

- KIEL C or similar embedded C Compiler for 8051
- MPLab

Text Book

- The 8051 Microcontroller, Architecture, Programming, & Appliations, 2nd Edition, Kenneth J. Ayala
- Programming & Customizing 8051 Microcontroller, Myke Predko, 1999, Mcgraw-Hill
- Design with PIC microcontroller, Peatman, John B, Pearson Educations

Course Code	CSC451-460	Course title	Elective 4
Number of Credits	3	Internal / External	20/80
Total Contact Hours (Th)	3Hrs/week	Total Contact Hours (Pr)	-

1.CSC451 – Neural Network and Deep Learning

Prerequisites:

Expected: - Programming: Basic Python programming skills, with the capability to work effectively with data structures.

Recommended: - Mathematics: Matrix vector operations and notation. - Machine Learning: Understanding how to frame a machine learning problem, including how data is represented will be beneficial. If you have taken my Machine Learning Course here, you have much more than the needed level of knowledge.

Course Description: If you want to break into cutting-edge AI, this course will help you do so. Deep learning engineers are highly sought after, and mastering deep learning will give you numerous new career opportunities. Deep learning is also a new "superpower" that will let you build AI systems that just weren't possible a few years ago. In this course, you will learn the foundations of deep learning. When you finish this class. This course also teaches you how Deep Learning actually works, rather than presenting only a cursory

or surface-level description. So after completing it, you will be able to apply deep learning to your own applications. If you are looking for a job in AI, after this course you will also be able to answer basic interview questions.

Course Objectives: by end of the course student will be able to

- Understand the major technology trends driving Deep Learning
- Be able to build, train and apply fully connected deep neural networks
- Know how to implement efficient (vectorized) neural networks
- Understand the key parameters in a neural network's architecture

Course Outline

Unit-1: Introduction to deep learning, Be able to explain the major trends driving the rise of deep learning, and understand where and how it is applied today.

Unit-2: Neural Networks Basics, Learn to set up a machine learning problem with a neural network mindset. Learn to use vectorization to speed up your models.

Unit-3: Shallow neural networks, Learn to build a neural network with one hidden layer, using forward propagation and backpropagation.

Unit-4: Deep Neural Networks, Understand the key computations underlying deep learning, use them to build and train deep neural networks, and apply it to computer vision.

Unit-5: Case Study: Computer Vision, Neural Network, Pattern Recognition examples

References:

- Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press ,2016 **Web Links**:

- https://www.coursera.org/learn/neural-networks-deep-learning
- http://cs230.stanford.edu/syllabus.html
- http://www.deeplearningbook.org/
- http://www.deeplearningbook.org
- http://www.bu.edu/eng/files/2017/03/DeepLearningSyllabusandSchedule.pdf

2.CSC452 – Big Data Analytics

Pre-requisites:

Expected : Student must have Understanding of Relational database normalization techniques, Physical design of a database, Concepts of algorithm design and analysis, Basic understanding of Software engineering

principles and techniques, Probability and statistics – correlations, Bayesian theory, regression, hypothesis testing etc Recommended: Student must have programming experience in C,C++, Python

Course Objectives:

- To understand the structure of Data Warehouse
- To understand different data pre-processing techniques.
- To understand basic descriptive and predictive data mining techniques.
- To use data mining tool on different data sets To understand Classification algorithms To understand Prediction algorithms.
- To understand Clustering algorithms.
- To use data mining tool on different data sets

Course Outcomes:

The student will get knowledge of:

- Data processing and data quality.
- Modelling and design of data warehouses.
- Write parallelize programs and use basic tools like MPI and POSIX threads.
- Apply core ideas behind parallel and distributed computing.
- Use methodologies adopted for concurrent and distributed environment.

Course Outline

Unit 1 : Introduction to Data Warehousing and Mining

Basic concepts of data mining, Types of Data to be mined, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Discovery in Databases, Data Mining Issues, Applications of Data Mining, Data Warehouse and DBMS Architecture of Data Warehouse, Multidimensional data model, Concepts of OLAP and Data Cube, OLAP operations, Dimensional Data Modelling- Star, Snow flake schemas

Unit 2: Data Processing

Need Data pre-processing, Attributes and Data types, Statistical descriptions of Data, Handling missing Data, Data sampling, Data cleaning, Data Integration and transformation, Data reduction, Discretization and generating concept hierarchies Association Rule Mining: Basic idea: item sets, Frequent Item-sets, Association Rule Mining, Generating item sets and rules efficiently, FP growth algorithm

Unit 3: Classification, Prediction and Clustering

Classification: Definition of Classification, Decision tree Induction: Information gain, gain ratio, Gini Index, Issues: Over-fitting, tree pruning methods, missing values, continuous classes, Classification and Regression Trees
(CART), Bayesian Classification: Bayes Theorem, Naïve Bayes classifier, Bayesian Networks, Linear classifiers, Least squares, SVM classifiers, Lazy Learners (or Learning from Your Neighbors) Prediction: Definition of Prediction Linear regression, Non-linear regression, Logistic regression Clustering: Definition of Clustering Partitioning Methods, Hierarchical Methods, Distance Measures in Algorithmic Methods, Density Based Clustering

Unit 4: Parallel and Distributed Computing

Introduction, Benefits and Needs, Programming Environment, Theoretical Foundations- Parallel Algorithms Parallel Models and Algorithms Sorting- Matrix Multiplication- Convex Hull- Pointer Based Data Structures. Synchronization- Process Parallel Languages- Architecture of Parallel and Distributed Systems- Consistency and Replication- Security- Parallel Operating Systems.

Unit 5: Introduction to HADOOP

Introduction to distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read, NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce Paradigm, Map and Reduce tasks, Job, Task trackers – Cluster Setup – SSH &Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

Reference Books

- Data Mining: Concepts and Techniques, Han, Elsevier ISBN: 9789380931913 / 9788131205358 Margaret H. Dunham, S. Sridhar, Data Mining – Introductory and Advanced Topics, Pearson Education
- Data warehousing: fundamentals fot IT professionals 3rd edition , Kimball, Wiley Publication
- Ian H.Witten, Eibe Frank Data Mining: Practical Machine Learning Tools and Techniques, Elsevier/(Morgan Kauffman), ISBN:9789380501864
- Introduction to Data Mining (2005) By Pang-Ning Tan, Michael Steinbach, Vipin Kumar Addison Wesley ISBN: 0-321-32136-7
- Jacek Błażewicz, et al., "Handbook on parallel and distributed processing", Springer Science & Business Media, 2013.
- Andrew S. Tanenbaum, and Maarten Van Steen, "Distributed Systems: Principles and Paradigms". Prentice-Hall, 2007.
- George F.Coulouris, Jean Dollimore, and Tim Kindberg, "Distributed systems: concepts and design", Pearson Education, 2005.
- Gregor Kosec and Roman Trobec, "Parallel Scientific Computing: Theory, Algorithms, and Applications of Mesh Based and Meshless Methods", Springer, 2015
- Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
- Chris Eaton, Dirk deroos et al. "Understanding Big data ", McGraw Hill, 2012.
- Tom White, "HADOOP: The definitive Guide", O Reilly 2012.
- MapReduce Design Patterns (Building Effective Algorithms & Analytics for Hadoop) by Donald Miner & Adam Shook

3.CSC453 – Hyperspectral Image Processing

Course Prerequisite: Theoretical and Practical knowledge of Remotely Sensed Digital Image Analysis.

Course Outcomes:

- Able to describe multispectral and hyperspectral remote sensing.
- Ability to design and extract the thematic information.
- Able to apply hyperspectral data in various field of applications.

- Able to design and develop hyperspectral data processing and analysis system.
- Able to frame advancements of research problems **Course Objectives:**
- Describing the principle of hyperspectral remote sensing.
- Recognize how to collect hyperspectral data.
- Process and Analyse hyperspectral data.
- Recognize the current research status of hyperspectral remote sensing.
- Project design using hyperspectral data.

Course Outline

Unit 1 Background of Hyperspectral Remote Sensing:

Concept of Imaging Spectroscopy, Historical background of Imaging Spectroscopy, Difference between Hyperspectral and Multispectral, HRS for Earth Observation, Present and Future Missions by worldwide agencies, Types of Data, Field Spectroradiometer, In situ spectral measurement, Characteristics of Imaging and Non Imaging data, Recording Format of imaging data, Levels of processing.

Unit 2 Geometric and Radiometric Corrections:

Basics of Pre-processing, Geometric error and corrections, Radiometric Error and Corrections, Atmospheric Corrections, Scene based empirical approach, Radiative Transfer Model based approach, Ancillary information necessary for atmospheric corrections.

Unit 3 Hyperspectral Data Pre-processing:

Spatial/Spectral Subset, bad band Removal, Bad Column Removal, DN to Radiance conversion, Atmospheric corrections using FLAASH and QUAC.

Unit 4 Dimensionality Reduction and Endmember Extraction:

Issue of Dimensionality in HRS data, Approaches to resolve the issues, Techniques of Dimensionality Reduction: Principle Component Analysis (PCA), Minimum Noise Fraction (MNF), Independent Component Analysis etc. Concept of End Members, reference spectra, Spectral Library, End member collection from Image, Endmember Extraction Techniques, Pixel Purity Index (PPI).

Unit 5 Classification and Mapping of Hyperspectral Data:

Classification, Classification Approaches, Supervised classification, unsupervised classification, Parametric Classifier, Non Parametric classifier, Per-pixel approach, Sub-Pixel approach, Spectral Unmixing, Spatial Spectral methods, commonly used Classification Techniques, Spectral Angle Mapper, Spectral Feature Fitting, Mixed tune Map Filtering etc.

Reference Material:

Text Books:

- Chang, C. I. (2013). Hyperspectral data processing: algorithm design and analysis. John Wiley & Sons.

- Chang, C. I. (2003). Hyperspectral imaging: techniques for spectral detection and classification (Vol. 1). Springer Science & Business Media.
- Varshney, P. K., & Arora, M. K. (2004). Advanced image processing techniques for remotely sensed hyperspectral data. Springer Science & Business Media.

Web Resources:

- http://www.isro.org
- http://www.usgs.gov

4.CSC454 – Internet of Things

Prerequisite: Students attending this course must have knowledge of python programming, digital electronics and micro controller programming.

Course Description: Internet of Things: an evolving technology than this course is for you. You will learn everything from high level controllers to interactive dashboard designing

Course Outcome

- Understand what Internet of Things are
- Controlling home appliances from anywhere in the world
- Use some of the physical devices like Arduino and Raspberry Pi
- Design some of the IoT applications

Course Outline

Unit -1: Introduction and Concepts: Definition and Characteristics of Introduction to IoT, Physical design of IoT, Things in IoT, IoT protocols, Logical Design of IoT, IoT functional blocks, IoT communication Model, IoT Communication API, IoT Enabled Technologies.

Unit -2: Developing IoT : IoT platform and design methodology – Purpose & requirement specification, process specification, Domain Model specification, Information Model Specification, service specification, IoT level specification, functional view specification, Operational view specification, Device & Component Integration, Application Development.

Unit -3: IoT Physical Device Endpoints – Basic building blocks of an IoT Device, Exemplary Device Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python.

Unit -4: IoT and M2M – Machine 2 Machine, Difference between IoT and M2M, Web of Things, Applications – Remote Monitoring and Sensing, Remote Controlling, Performance Analysis. Security aspects of IoT.

Unit -5: Application of IoT with Domain Specific tools: Case studies on Intrusion Detection, Smart Parking, Smart Roads, Surveillance, Emergency response, Air/Noise Pollution Monitoring Systems, Prognostics, Smart Irrigation, Green House Controls and Wearable Electronics.

Reference Book

1. Internet of Things (A Hands-on-Approach) , Vijay Madisetti , Arshdeep Bahga
2. Getting Started with Internet of Things : Connecting Sensors and Microcontrollers to the cloud by Cuno Pfister, O'Rielly Publications

Semester IV (Industrial Internship / Field Work Projects / Research Projects)

Paper Code	Course	Total Theory Credits	Total Practical Credits	Internal	External	Total
CSC416	Dissertation Review 1	-	3	50	-	50
CSC417	Dissertation Review 2	-	3	50	-	50
CSC418	Dissertation Review 3	-	3	50	-	50
CSC419	Final Dissertation	-	5	-	100	100
CSC420	Seminar	-	2	-	50	50
			16			

Dissertation

Course Objectives:

1. To provide comprehensive learning platform to students where they can enhance their employ ability skills/research skills and become job/research ready along with real corporate/field work/research exposure.
2. To enhance students' knowledge in implementing learned concepts.
3. To increase self-confidence of students and helps in finding their own proficiency.
4. To cultivate student's leadership, problem solving and self-learning abilities and responsibility to perform or execute the given task.
5. To provide learners hands on practice within a real job situation.

Course Outline

1. Final Year Dissertation includes any one of either industrial Internship/field work project/Research Project representing the culmination of study towards the Master of Computer Science. Internship/Projects offer the opportunity to apply and extend material learned throughout the program. Projects are undertaken individually or in small groups of not more than two students.
2. The projects undertaken span a diverse range of topics, including theoretical, simulation and experimental studies. The emphasis is necessarily on facilitating student learning in technical, project management and presentation spheres. This necessarily introduces the dimension of workload management into the program to enable completion of a large, relatively unstructured "assignment" over the course of the semester.
3. Assessment will be done by means of three internal reviews and one external examination in the form of presentation, submission of a dissertation, and a demonstration of work undertaken.
4. 14 credits will be awarded to the dissertation work.
5. 2 credits for the seminar. Seminar topic must be relevant and as per the current trends in research and technology development.

Course Outcomes:

1. Capability to acquire and apply fundamental principles of Computers Science.
2. Become master in one's specialized technology.
3. Ability to communicate efficiently.
4. Capacity to be a multi-skilled Computer Science professional with good technical knowledge, management, leadership and entrepreneurship skills.
5. Ability to identify, formulate and model problems and find solution based on a systems approach.

6. Capability and enthusiasm for self-improvement through continuous professional development and life-long learning.

Seminar

Course Objectives

1. To study research papers for understanding of a new field, in the absence of a textbook, to summarise and review them.
2. To identify promising new directions of various cutting edge technologies.
3. To impart skills in preparing detailed report describing the topic.
4. To effectively communicate by making an oral presentation before an evaluation committee

Course Outline

1. The students are expected to choose a topic either in cutting edge technologies or current trends in research. Seminars are to be carried out individually.
2. Students should make in-depth study of the topic chosen and prepare a technical report on the same.
3. In terms of content of the report, students should show competence in identifying relevant information, defining and explaining topics under discussion.
4. They should demonstrate depth of understanding.and make use of primary and secondary sources.
5. Assessment of this course will be done externally and 2 credits will be awarded on successful completion.

Course Outcomes

1. Ability to evaluate information and use and apply relevant theories.
2. Ability to organize and show competence in working with a methodology, structuring their oral work, and synthesizing information.
3. Ability to deliver, and make use of visual, audio and audio-visual material to support their presentation.
4. Ability to speak cogently with or without notes and present and discuss either works as an individual.

Paper Code	Course Title	Total Theory Credits	Total Practical Credits	Internal Marks	External Marks	Total Marks
CSC535	Intellectual Property Rights	3	-	20	80	100
CSC536	Development of Soft Skill and Personality.	3	-	20	80	100
CSC537	R-Tool	3	-	20	80	100
CSC538	Communication Skills	3	-	20	80	100
CSC539	Introduction to MATALB	3	-	20	80	100

INTELLECTUAL PROPERTY RIGHTS

Objectives:

- To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
- To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
- To disseminate knowledge on copyrights and its related rights and registration aspects
- To disseminate knowledge on trademarks and registration aspects
- To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects
- To aware about current trends in IPR and Govt. steps in fostering IPR

Unit-1:

Introduction and the need for intellectual property right (IPR) - Kinds of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge – Trade Secret - IPR in India : Genesis and development – IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967,the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994

Unit-2:

Patents - Elements of Patentability: Novelty , Non Obviousness (Inventive Steps), Industrial Application - Non - Patentable Subject Matter - Registration Procedure, Rights and Duties of Patentee, Assignment and licence , Restoration of lapsed Patents, Surrender and Revocation of Patents, Infringement, Remedies & Penalties - Patent office and Appellate Board

Unit-3:

Nature of Copyright - Subject matter of copyright: original literary, dramatic, musical, artistic works; cinematograph films and sound recordings - Registration Procedure, Term of protection, Ownership of copyright, Assignment and licence of copyright - Infringement, Remedies & Penalties – Related Rights - Distinction between related rights and copyrights

Unit-4:

Concept of Trademarks - Different kinds of marks (brand names, logos, signatures, symbols, well known marks, certification marks and service marks) - Non Registrable Trademarks - Registration of Trademarks - Rights of holder and assignment and licensing of marks - Infringement, Remedies & Penalties - Trademarks registry and appellate board

Unit-5:

Design

Design: meaning and concept of novel and original - Procedure for registration, effect of registration and term of protection

Geographical Indication (GI)

Geographical indication: meaning, and difference between GI and trademarks - Procedure for registration, effect of registration and term of protection

Course Outcomes:

- The students once they complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works
- During their research career, information in patent documents provide useful insight on novelty of their idea from state-of-the art search. This provide further way for developing their idea or innovations
- Pave the way for the students to catch up Intellectual Property(IP) as an career option
- R&D IP Counsel
- Government Jobs – Patent Examiner
- Private Jobs
- Patent agent and Trademark agent
- Entrepreneur

Text book:

1. Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited.

2. Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited.

Reference book:

1. Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.

E-resources:

1. Subramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights – An Overview. Retrieved from http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf

2. World Intellectual Property Organisation. (2004). WIPO Intellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf

Reference Journal:

1. Journal of Intellectual Property Rights (JIPR): NISCAIR

Useful Websites:

1. Cell for IPR Promotion and Management (http://cipam.gov.in/)
2. World Intellectual Property Organisation (https://www.wipo.int/about-ip/en/)
3. Office of the Controller General of Patents, Designs & Trademarks (http://www.ipindia.nic.in/)

Development of Soft Skills and Personality Development

The course aims to cause a basic awareness about the significance of soft skills in professional and inter-personal communications and facilitate an all-round development of personality. Hard or technical skills help securing a basic position in one's life and career. But only soft skills can ensure a person retain it, climb further, reach a pinnacle, achieve excellence, and derive fulfilment and supreme joy. Soft skills comprise pleasant and appealing personality traits as self-confidence, positive attitude, emotional intelligence, social grace, flexibility, friendliness and effective communication skills.

Unit 1: Introduction: A New Approach To Learning,
Planning And Goal-Setting
Human Perceptions: Understanding People
Types Of Soft Skills: Self-Management Skills
Aiming For Excellence: Developing Potential And Self-Actualisation
Need Achievement And Spiritual Intelligence

Conflict Resolution Skills: Seeking Win-Win Solution

Inter-Personal Conflicts: Two Examples
Inter-Personal Conflicts: Two Solutions
Types Of Conflicts: Becoming A Conflict Resolution Expert
Types Of Stress: Self-Awareness About Stress
Regulating Stress: Making The Best Out Of Stress

Unit 2: Guiding Principles
Identifying Good And Bad Habits
Habit Cycle
Breaking Bad Habits
Using The Zeigarnik Effect For Productivity And Personal Growth
Forming Habits Of Success
Communication: Significance Of Listening
Communication: Active Listening
Communication: Barriers To Active Listening
Telephone Communication: Basic Telephone Skills
Telephone Communication: Advanced Telephone Skills
Telephone Communication: Essential Telephone Skills

Unit 3 Technology And Communication: Technological Personality
Technology And Communication: Mobile Personality?
Topic: Technology And Communication: E-Mail Principles
Technology And Communication: How Not To Send E-Mails!
Technology And Communication: Netiquette
Technology And Communication: E-Mail Etiquette

Communication Skills: Effective Communication
Barriers To Communication: Arising Out Of Sender/Receiver's Personality
Barriers To Communication: Interpersonal Transactions
Barriers To Communication: Miscommunication
Non-Verbal Communication: Pre-Thinking Assessment-1
Non-Verbal Communication: Pre-Thinking Assessment-2

Unit 4 Nonverbal Communication: Introduction And Importance
Non-Verbal Communication: Issues And Types
Non-Verbal Communication: Basics And Universals
Non-Verbal Communication: Interpreting Non-Verbal Cues

Body Language: For Interviews
Body Language: For Group Discussions

Unit 5 : Presentation Skills: Overcoming Fear
Presentation Skills: Becoming A Professional
Presentation Skills: The Role Of Body Language
Presentation Skills: Using Visuals
Reading Skills: Effective Reading
Human Relations: Developing Trust And Integrity

Books and references

Dorch, Patricia. *What Are Soft Skills*? New York: Execu Dress Publisher, 2013.
Kamin, Maxine. *Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders*. Washington, DC: Pfeiffer & Company, 2013.
Klaus, Peggy, Jane Rohman & Molly Hamaker. *The Hard Truth about Soft Skills*. London: HarperCollins E-books, 2007.
Petes S. J., Francis. *Soft Skills and Professional Communication*. New Delhi: Tata McGraw-Hill Education, 2011.
Stein, Steven J. & Howard E. Book. *The EQ Edge: Emotional Intelligence and Your Success*. Canada: Wiley & Sons, 2006.

R-Tool

About the Course: In this course you will learn how to program in R and how to use R for effective data analysis. You will learn how to install and configure software necessary for a statistical programming environment and describe generic programming language concepts as they are implemented in a high-level statistical language. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code. Topics in statistical data analysis will provide working examples.

Unit-1:

This unit covers the basics to get you started up with R. The Background Materials lesson contains information about course mechanics and installation of R. This unit cover the history of R, go over the basic data types in R, and describe the functions for reading and writing data. Operator Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Miscellaneous Operators.

Unit-2:

Welcome to unit 2 of R Programming. This unit, will take the gloves off, and the lectures cover key topics like control structures and functions. Will also introduce the first programming assignment for the course. Decision Making Introduction, if statement, if...else statement, switch statement, if...else Ladder, ifelse() function, Loop Introduction, for loop, while Loop, repeat Loop, Break Statement, Next Statement.

Unit-3:

We have now entered the third unit of R Programming, which also marks the halfway point. The lectures in this unit cover loop functions and the debugging tools in R. These aspects of R make R useful for both interactive work and writing longer code, and so they are commonly used in practice. Matrix Introduction, Matrix Construction, Addition & Subtraction, Multiplication & Division.

Unit-4:

This unit covers how to simulate data in R, which serves as the basis for doing simulation studies. It also cover the profiler in R which lets you collect detailed information on how your R functions are running and to identify bottlenecks that can be addressed. Data Frame Introduction, Data Frame details, Filtering and subsetting data, Aggregate function.

Unit-5:

This unit covers the profiler which is a key tool in helping you optimize your programs. Finally, we cover the str function, which is the most useful function in R. Types of Input, CSV Files, Excel file, Reading and writing data, Graphical Procedures Introduction, plot function, Plot using base graphics, Plot using ggplot2.

References:

1. R in Action By - Robert L. Kabacoff, Latest Edition – Second, Formats Available - Paperback, Publisher - Dreamtech Press, Reading Level - Beginner/Intermediate.

2. R for Data Science, By - Hadley Wickham and Garrett Gorlemund, Latest Edition - First, Formats Available - Kindle and Paperback, Publisher - O'Reilly, Reading Level – Beginner.

Communication Skills

Course Objective:

1. To make the students aware of the importance of grammar and vocabulary in written and spoken communication which will lead to enhance interpersonal and social interaction.
2. To enable them to reflect and improve on their communicative behavior.
3. To train them to use language effectively to face interviews, group discussions and public speaking.

Prerequisite:

It is just assumed to have the basic knowledge of English language with an urge to develop it more effectively.

At Course Completion:

The student will be able to improve his writing and reading skills and will be having improved clarity of communication.

Course Outline

Unit-1:

Effective Communication:-Concept and meaning of communication, types of communication, attributes of effective communication, barriers to effective communication.

Tools of English: Spoken Vs. Written communication, Basic Grammar: parts of speech: Noun, Pronoun, Verb, Adjectives, Adverbs, prepositions, Conjunction and Interjection.

Unit-2:

Skill Enhancement:

Listening Skills: Understanding assignments to resolve problems and answer questions to understand the hidden meaning what people say.
Presentation Skills: Components of good presentation, group dynamics, speeches.
Fifteen principles to increase clarity of communication, effective speaking guidelines, pronunciation etiquettes.
Body language:-Importance, concept, nine emotions displayed through body language, zones of intimacy and desirable/undesirable body language in professional institutes.

Unit-3:
Technical Communication:
Writing of memos, e-mail, letter writing, business letters, cover letters, social and goodwill letters, adjustment letters, bank and insurance letters, resumes, memos e-mail etiquettes, reports, basics of report writing, technical proposal and comprehension.

Unit-4:
Career Skills: Applying for job, interviews, types of interviews, group discussions, key steps to succeed in group discussion, resume profiling, strategy of resume writing, difference between a resume and curriculum vitae.

Unit-5:
Soft skills: Classification of soft skills, Communication and networking, Empathy (Understanding other person's view), Intrapersonal skills, Interpersonal skills, Negotiation skills.

Books:

- Effective Communication by Urmila Rai and S.M.Rai.

Reference Books:-

1) "Communication skills" by Meenakshi Raman and Sangeeta Sharma
2) "Technical Communication-Principles and Practice" by Meenakshi Raman and Sangeeta Sharma.
3) Personality Development and Soft Skills by Barun K. Mitra

Introduction to MATALB

Course Objective:
To provide the general basic flavor of MATLAB Environment to the students so that they can apply it for their specific domain.

Prerequisite:
Basic knowledge of any programming environment

At Course Completion:

Students can develop good GUI based application to solve their mathematical, statically or any data processing applications in MATLAB.

Course Outline

Unit-1:

Introduction: What is MATLAB? Advantages and Disadvantages, MATLAB Architecture, MATLAB System, Typical Uses of the MATLAB, Application Areas.

Starting with MATLAB: Introduction, Development Environment, MATLAB search path, Typing Commands, Variables and Numbers, Vectors and Matrices

Unit-2:
Data Types, Operators & Control Statements: Introduction, Data Types, Operator, Flow Control Statements.
M-file Programming: Introduction, Program Development, M-file programming, M-file Types, Function Arguments, Function Types, Function Handle, P-Code, MATLAB Expression and Regular Expression, Error Handling.

Unit-3:
Advanced capabilities in MATLAB: Introduction, Cell Array, Structure, Sparse Array
Mathematics: Introduction, Matrices, Linear Equation, Factorization, Eigenvalues, Polynomial, Interpolation, Data Analysis, Polynomial Regression, Fourier Approximation, Integration and Differentiation, Differential Equation.

Unit-4:
Graphics: Introduction, 2-D Plotting, Plot style option, How to edit plot, Basic Statistics of the Graph, The Plots Creating, Animation, Graphics Object Handling, 3-D visualization.
Graphical User Interface: Introduction, GUI layout tools, Dialog box, List Box, Accessing variables from workspace, GUI Components, Solved Example.

Unit-5:
Application Program Interface (API) or External Interfaces: Introduction, Import and Export Data, Low level File I/O Functions, Calling C-programs from MATLAB,Calling Java from MATLAB.

References:

1. www.mathworks.com (MATLAB Toolbox)
2. "Understanding MATLAB" by Shroff Publications, 2013, Authors: K V Kale, R R Manza, V T Humbe, P L Yannawar and G. R. Manza, Shroff Publications

29/11/21

Dean
Faculty of Science & Technology
Dr. Babasaheb Ambedkar Marathwada
University, Aurangabad