।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

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प्रस्तुत विद्यापीठाच्या उप–केंद्र, लातूर येथील तंत्रज्ञान संकुलातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील द्वितीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७–२०२० च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या उप–केंद्र, लातूर येथील तंत्रज्ञान संकुलातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील द्वितीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्यात येत आहे.

01. M.Sc.-II Year-Computer Science
02. M.Sc.-II Year-Bioinformatics

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेत–स्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पदव्युत्तर (उपकेंद्र, लातूर)–सीबीसीएस अभ्यासक्रम/२०२०–२१/**५१४**
दिनांक : ०८.०८.२०२०.

स्वाक्षरित/–
उपकुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) मा. संचालक, स्वा.रा.ती.म. विद्यापीठ, नांदेड, उप–केंद्र, औसा रोड, पेठ, लातूर – ४१३ ५३१.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University
Nanded
(NAAC Re-accredited with 'A' Grade)

School of Technology
Sub Centre, Latur

Syllabus of

Second Year M.Sc. Computer Science

(Revised CBCS pattern)
(Program code: STHL-S-MCS-PG (62-2-1-01)

Introduced from Academic Year 2020-2021

School of Technology,
SRTMUN Sub-Centre, Latur

M.Sc. Computer Science

M.Sc. Computer Science (2years) degree builds the student on higher studies in Computer Science and to become competent in the current race and development of new computational technologies. The duration of the study is of four semesters, which is normally completed in two years. The primary goal of this M.Sc. program is to increase the understanding of Communication Technology. What sets it apart from others is its approach and focus on developing and applying computationally intensive techniques to achieve higher goals in life. Major inputs given in the curriculum are from the field of image processing, signal processing, machine learning, genetic algorithm, remote sensing and GIS etc. are parts in this direction.

CBCS pattern and CGPA system

The School introduces revised M.Sc. Computer Science program as per CBCS (Choice based credit system) pattern, in which choice, is given to the students under open electives and subject electives. The students can choose open electives from the same course or from other course of the same school or from other courses of other schools.

The Evaluation of performances of students for the course under Choice based Credit system (CBCS) is based on CGPA (Cumulative Grade Point Average) formulae. A Cumulative Grade Point Average is the mean Grade Point Average (GPA) from all academic terms within a given academic year, whereas the GPA may only refer to one term.

Eligibility and Fees

The eligibility of a candidate to take admission to **M.Sc. Computer Science** program is as per the eligibility criteria fixed by the University. More details on admission procedure and fee structure can be seen from the prospectus of the University as well as on website of the University.

Features of CBCS pattern

[1] Master Degree would be of 100 Credits

[2] Each semester shall consists of four theory courses and two practical courses and one open elective and one skill based activity

[3] Four theory courses = 16 Credits

[4] two practical courses= 4 Credits

[5] one open elective =4 credits

[6] one skill based activity=1 credit

[7] Total credits per semester= 25

[8] Total Credits of Four Semesters= 100

[9] Total marks per semester= 625

[10] Total marks for Master Degree program =2500

[11] One Credit = 25 marks , Two Credits = 50 Marks

[12] Four Credits = 100 Marks

[13] Each Theory Course/Practical course = 100 Marks

Internal Exam evaluation	External Exam evaluation
50 Marks = 2 Credits	50 Marks = 2 Credits

[14] Break up of internal marks evaluation for each Theory course (choose any two)

Home Assignments / Two tests /Seminar / Mini Project/ E – Content Development / Examination/ Skill based activity or **Concerned Teacher can adopt any other internal evaluation method as per requirement of course.**	Total Marks 50 Marks = 2 Credits

[15] Practical Course = 50 Marks

Internal Exam evaluation	External Exam evaluation
25 Marks = 1 Credit	25 Marks = 1 Credit

[16] Break up of internal exam marks for Practical

Internal Exam	Total Marks
Record Book * and choose any one from following Experiments / Mini Project/ E – Content Development / Examination/ **Concern Teacher can adopt any other internal evaluation method as per requirement of**	25 marks = 1 Credit

course.	

*** Compulsory**

[17] The open elective has 04 credits which are purely internal. If students are opting for MOOCs as open elective, then, there must be a Faculty designed as MOOCs course coordinator who shall supervise learning through MOOCS. This is intentionally needed as the MOOCs course coordinator shall verify the MOOC details including its duration, staring date, ending date, syllabus contents, mode of conduction, infrastructure feasibility, and financial feasibility during start of each semester. This is precautionary as the offering of the MOOCs through online platforms are time specific and there must be proper synchronization of semester duration with the MOOCs duration. Students must opt for either institutional / college level open elective or a course from University recognized MOOCs platforms as open electives.

[18] The number of hours needed for completion of theory and practical courses as well as the passing rules, grading patterns, question paper pattern, number of students in practical batches, etc shall be as per the recommendations, norms, guidelines and policies of the UGC, State Government and the SRTM University currently operational.

Programme objectives:

- To increase the understanding of core Computer Science subjects at Master's level
- To focus on developing and applying computationally intensive techniques • To handle the IT solutions and software's
- To make the student aware of existing, new and applied technological aspects emerging in the world.

Programme outcomes:

- Learners are able to plan and conduct research work by considering to develop applications for society at large
- Learners could able to face challenges of current research areas problems
- Participants are able to apply computationally intensive techniques
- Students are able to face competitive exams as well as NET/SET exams in the subject of computer Science

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
First Semester						
1.	**Core Subjects**	LCS-101	Computer Organization and Architecture	2	2	4
2		LCS-102	Advanced Operating System	2	2	4
3		LCS-103	Design and Analysis of Algorithm	2	2	4
Choose any one from below elective subjects						
4	**Elective Subject**	LCS-104 A	Principles of Programming Languages	2	2	4
		LCS-104 B	Java Programming			
Practical /Lab						
5	**Lab / Practical**	LCS-105	Lab-1: Advanced Operating System	1	1	2
		LCS-106	Lab-2: Based on LCS-104 A or LCS-104B	1	1	2
6	**Open Elective**	LCS-107A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		LCS-107 B	Introduction to E-commerce			
7	**Skill based Activity**	LCS-108	SK-01	1	0	1
	Total credits					**25**

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
Second Semester						
1.	**Core Subjects**	LCS-201	Advances in DBMS	2	2	4
2		LCS-202	Mathematical Foundation for Computer Science	2	2	4
3		LCS-203	Software Engineering	2	2	4
Choose any one from below elective subjects						
4	**Elective Subject**	LCS-204A	Web Technology Tools	2	2	4
		LCS-204 B	Python Programming			
Practical /Lab						
5	**Lab / Practical**	LCS-205	Lab-3: Data Base Management System	1	1	2
		LCS-206	Lab-4: Based on LCS-204 A or LCS-204 B	1	1	2
6	**Open Elective**	LCS-207A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		LCS-207B	Networking Concept			
7	**Skill based Activity**	LCS-208	SK-02	1	0	1
	Total credits					**25**

***LCS- Latur Sub Centre Computer Science**

w.e.f, 2020-2021

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
Third Semester						
1.	**Core Subjects**	LCS-301	Compiler Design	2	2	4
2		LCS-302	Artificial Intelligence	2	2	4
3		LCS-303	Dot Net Programming using VB.NET	2	2	4
Choose any one from below elective subjects						
4	**Elective Subject**	LCS-304 A	Digital Image Processing	2	2	4
		LCS-304 B	Mobile Application Development			
Practical /Lab						
5	**Lab / Practical**	LCS-305	Lab-5: VB.NET Programming	1	1	2
		LCS-306	Lab-6 : Based on LCS-304 A or LCS-304 B	1	1	2
6	**Open Elective**	LCS-307A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		LCS-307 B	Information Technology			
7	**Skill based Activity**	LCS-308	SK-03: Seminar Presentation Activity	1	0	1
	Total credits					**25**

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
Fourth Semester						
1.	**Core Subjects**	LCS-401	Information Security	2	2	4
2		LCS-402	Soft Computing	2	2	4
3		LCS-403	Major Project development Activity	0	4	4
Choose any one from below elective subjects						
4	**Elective Subject**	LCS-404 A	Big Data Analysis	2	2	4
		LCS-404 B	Internet of Things (IoT)			
Practical /Lab						
5	**Lab / Practical**	LCS-405	Lab-7: Soft Computing	1	1	2
		LCS-406	Lab-8: Based on LCS-404 A or LCS-404B	1	1	2
6	**Open Elective**	LCS-407A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		LCS-407 B	Social Media Technology			
7	**Skill based Activity**	LCS-408	SK-04	1	0	1
	Total credits					**25**

Note:

1. **MOOC (NPTEL / SWAYAM) course opts by the student should be excluding syllabus.**
2. **Student must provide the MOOC (NPTEL / SWAYAM) course certificate before theory examination of the concern semester.**
3. **Student must register the MOOC (NPTEL / SWAYAM) course within the semester or previous semester registration is permissible for next semester credit transfer.**

Second Year , Third Semester

Course Title: Compiler Design

Course Code: LCS-301

Objectives

- To understand the phases of Compiler
- To aware the Finite Automata and Lexical Analysis
- To understand Parsing Techniques

Outcome:

- Students will be able to perform Syntax as well as Semantic analysis
- Students will be able to plot transition diagrams for DFA and NFA

Unit I: Introduction to Compilation

Compiler Basics, Issues in Compilation, Phases of Compilation: the Analysis – Synthesis Model, Compiler Construction Tools

Unit II: Designing a Lexical Analyzer

Role of Lexical Analysis, Input Buffering, Specification of Tokens, Recognition of Tokens, Regular Expression: Definition, Examples, & Identities, Finite Automata: Concept, DFA: Definition & examples, NFA: Definition, examples, Language accepted by FA, NFA with ε moves, Regular Expression to FA: Method and Problems, NFA with ε moves to NFA, NFA to DFA: Method Problems, Minimization of DFA: Problem using Table, Method - FA with output, Creating Lexical Analyzer with LEX

Unit III: Designing Syntax Analyzer

Role of Syntax Analyzer, Classification of parsers, **Top-Down Parsing:** Introduction, Problems in top-down parsing, Recursive Parsing, Problems in Recursive Procedures, Predictive Parsing, Error Handling in Predictive Parsers, **Bottom Up Parsing**: Shift Reduce Parser, Actions of shift reduce parser, parse tree, Operator Precedence Parsing, Components of operator precedence parsers, operator precedence parsers, Advantages and disadvantages of operator precedence Parsing. LR Parsing: Simple LR parser, LALR parser.

Unit IV: Intermediate Code Generation

Need For Intermediate Code Generation, Intermediate Forms: Polish Notation, Quadruples, Triples, **Unit V:**

Code Optimization

Introduction, need for code optimization, Classification of code optimization techniques: Optimization techniques that work on machine code, Optimization with in Basic Blocks: Folding, Redundant operation elimination, Optimization with in Loop: Strength Reduction, Dead code elimination, Moving operation within block out of block.

Suggested readings :

1. John E. Hopcroft , Rajeev Motwani, Jeffrey D. Ullman , "Introduction to Automata Theory, Languages and Computation" , Pearson education 2nd Ed

2. K.L.P.Mishra & N. Chandrasekaran, " Theory of Computer Science (Automata Languages And Computation)" , PHI 2nd Ed.
3. Aho A.V., R. Sethi and J.D. Ullman, Compiler Principle, Techniques and Tools , Addison Wesley.
4. Barret, Couch, Compiler Construction Theory and Practice, , Asian Student Edition.
5. Dhamdhere D.M, "Compiler Construction Principle and Practice", McMillan India.

Course Title: Artificial Intelligence

Course Code: LCS-302

Objectives:

- To understand the concept of Artificial Intelligence
- To study the Heuristic Search Techniques for problem solving
- To study knowledge representation and logic

Outcome:

- Students will be able to develop application for Machine intelligence
- Students will be able to use various searching techniques to find the solution of the problem

Unit I: Introduction

What is Artificial Intelligence: The AI Problems, Underlying Assumptions, AI Techniques

Unit II: Heuristic Search Techniques

Defining problem as State Space Search, production system, Problem Characteristics, Water Jug Problem, Generate and Test, Hill Climbing, Best First Search, A*,AO*

Unit III: Knowledge Representation and Logic

Representations and Mappings, approaches to Knowledge representation, Issues in Knowledge Representation, Introduction to Prepositional Logic and Predicate Logic, Representing Simple Facts in logic, representing Instance and ISA relationships.

Unit IV: Weak and Strong slots and Filler Structure

Weak slots and Filler Structure: Semantic Nets and Frames Strong slots and Filler Structure: Conceptual Dependency, Scripts

Unit V: Expert System and Agents

Expert Systems : Representing and using Domain knowledge, Expert System Shells, Explanation, Knowledge acquisition, Agents , internet and Soft bots ,Interface agents and reactive systems , Soft bots and info agents, the three layer model , process automation and agents

Suggested readings:

1. Edward A. Bender "Mathematical Methods in Artificial Intelligence", Wiley , 1996
2. Elaine Rich and Kerin Knight , "An Introduction to Artificial Intelligence", McGraw Hill, 4th ed., 2001
3. Kishen Mehrotra, Sanjay Rawika, K Mohan, "Elements of Artificial Neural Network"
4. Russell and Norvig , "Artificial Intelligence: a modern approach", PHI , 3rd ed, 2013
5. Patrik Henry Winston " Artificial Intelligence", 3rd ed., ISBN-10: 0201533774, 2004
6. Woolbridge, "Reasoning about Intelligent Agents", ISBN-10: 0262515563,

Course Title: DotNet Programming using VB.NET
Course Code: LCS 303
Objectives:

- To understand the basics and advances in .Net programming environment for developing good quality software project
- To apply .Net programming services for efficient and fast software development process
- To acquire web development skills using ASP.Net which is the industry demands

Outcome:

- Students will be able to establish the connectivity between form with database
- Students will be able to develop application using dotnet

Unit I: The Microsoft Dot Net Framework

Introduction to Microsoft .Net framework, Microsoft .Net framework architecture, Working of Common Language Runtime, CTS and CLS, Garbage collection, Assembly, Components of Assembly and their types.

Unit II: VB .Net Programming

Windows Forms: Working with forms, adding control to form, working with properties at design time, setting properties at run time, working with multiple forms, creating message box and input box and dialog box, handling events, creating MDI forms. **Controls:** Label control, Texbox, Button,Combobox, Listbox, Checkbox, Radio Button, Group Box, Panel, Picture Box, Progress bar, Timer, Treeview, Menustrip and Built in Dialogue boxes **Mouse Events:** Click, DoubleClick, Mouse UP and Down, Hover **Keyboard Events**: Keypress, Keydown, Keyup. **Console Applications** Structure of console program, input output statements, keywords, tokens, constants identifiers, Decision making statements, Control flow statements.

Unit III: Object Oriented Programming using VB .Net

Class and objects, propertied, methods and events, member functions, constructor and destructors, Inheritance, Access modifiers: Private, Public, Protected, Friend, Interfaces, and Polymorphism.

Unit IV: Web Applications Using VB. Net

Introduction to ASP.Net, features of ASP.Net, Anatomy of ASP.NET pages, creating web applications using ASP.Net, working with web forms, events handling, multiform web applications, Data preservation in client and server, ASP.Net controls: Button, Label control, Texbox, Button, Combobox, Listbox,Checkbox, Radio Button, Tables, Hyper Links and Image Buttons, LinkButtons, Group Box, HTML controls, Validation controls

Unit V: Databases in VB.Net

Database connection, Data adapter, Datasets, connection to the database with server control, data binding with some control like Text Boxes, List boxes, Navigating Data source, data validation, connection objects, command object, connected and disconnected architecture using ADO.Net.

Suggested readings:

1. Math J. Croush , "ASP.net & VB.net web programming" (Pearson Education) ISBN-10: 0201734400
2. Willis, Cross Land and Blair , "Beginning VB.NET 2003" , Wiley
3. Steven Holzner , "Visual Basic .Net Programming Black Book" wiley , 2005

Course Title: DIGITAL IMAGE PROCESSING
Course Code: LCS 304 A
Objective:

- To understand the techniques and tools for digital image processing as development of DIP based application development
- To Introduce image analysis techniques in the form of image segmentation
- The course is primarily meant to develop on-hand experience in applying these tools to process the images

Outcome:

- Students will be able to use the tools used for Digital Image Processing
- Students will be able to perform Image Classification, Image Enhancement and Image Segmentation

Unit I: Introduction and fundamentals of DIP

The Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing Digital Image Fundamentals, Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization , Some Basic Relationships between Pixels, An Introduction to the Mathematical Tools Used in Digital Image Processing

Unit II: Intensity Transformations and Spatial and frequency Domain.

Background, Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters Filtering in the Frequency Domain, Preliminary Concepts, The Discrete Fourier Transform (DFT), The Basics of Filtering in the Frequency Domain, Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters.

Unit III: Morphological Image Processing

Erosion and Dilation, Opening and Closing, Gray-Scale Morphology, Some Basic Morphological Algorithms

Unit IV: Image Segmentation

Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation,

Segmentation Using Morphological Watersheds

Unit V: Object Representation, Description and Recognition

Representation, Boundary Descriptors, Region Descriptors, Pattern and Pattern Classes, Matching.

Suggested readings:

1. A.K. Jain, PHI, New Delhi, "Fundamentals of Digital Image Processing ",2012
2. Chanda Dutta Magundar, "Digital Image Processing and Applications", Prentice Hall of India, 2000
3. Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy, "Image Processing Analysis and Machine Vision" (1999)
4. Rafael C Gonzalez, Richard E Woods 2nd Ed., "Digital Image Processing" Pearson Education2003.
5. William K Pratt, "Digital Image Processing", John Willey (2001).

Course Title: Mobile Application Development
Course Code: LCS 304 B
Objectives:

- To aware the programming environment of Android Studio
- To develop an application using android studio
- To connect form with database using android studio

Outcome:

- Students are able to Andriod apps
- Students are able to understand how to convert existing apps into android app

Unit I : Mobile Application Development

Introduction to handheld devices (Palm, Pocket Pc,Symbian OS smart phones, MS windows based smart phones, BlackBerry, iphone etc.),features of handheld devices, Device Applications Vs Desktop application, overview of application development platforms (OS-Palm OS, Symbian, BlackBerry, Windows CE, OS for iphone, Android), Programming Languages (C/C++, JAVA), IDE tools. Comparison of Android with other Mobile OS. Comparative study of all versions of Android, Introducing Services, Using Background Worker Threads,Using Toast, Introducing Notifications, Using Alarms.

Unit II: Android Operating System Installations

Background, What is android and what isn't, Open Mobile Development Platform, Native Android Applications, Android SDK Features, Introducing the Open Handset Alliance, What Does Android Run On? Why Develop for Android?, Introducing the Development Framework. What Comes in the Box, Developing for Android, Developing for Mobile Devices, Android Development Tools as per current version, Installations, Emulator

Unit III: Creating Applications, activities and User Interfaces

What Makes an Android Application?, Introducing the Application Manifest. Using the Manifest Editor, The Android Application Life Cycle. Understanding Application Priority and Process States, Externalizing Resources. A Closer Look at Android Activities. Fundamental Android UI Design. Introducing Views. Introducing Layouts and fragments, Using Adapters, Creating New Views.

Unit-IV: Intents, Broadcast Receivers, and the Internet

Introducing Intents, Creating Intent Filters and Broadcast Receivers, Using Internet Resources. Introducing Dialogs and Action Bars, Creating and Using Menus.

Unit-V : Data Storage, Retrieval, and Sharing:

FILES, SAVING STATE, AND PREFERENCES: Saving Application Data, Creating and Saving Shared Preferences, Retrieving Shared Preferences, Introducing the Preference Framework and the Preference Activity, Persisting the Application Instance State, Including Static Files as Resources, Working with the File System. DATABASES AND CONTENT PROVIDERS: Introducing Android Databases, SQLite Databases, Content Providers, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases, Creating Content Providers.

Suggested readings:

1. Reto Meier. Professional Android Application Development, Wrox Publications ISBN: 978-0-470-34471-2.
2. Rick Rogers, John Lombardo, Zigurd Mednieks, G. Blake Meike. Android Application Development: Programming with the Google SDK. O'Reilly ISBN 10: 0596521472 / ISBN 13: 9780596521479.
Auxiliary Resources:
https://developer.android.com/index.html

Course Title: Lab V
Course Code: CS 305
Practical based .Net Programming

1. Program for changing the properties of form at run time and displaying the message in the textbox “Welcome to VB.Net”.
2. Console program for checking the odd/even number using simple if statements.
3. Console program for checking the prime number from 1-100 using while and for loop.
4. Console program for decision making in grade of the students as per their percentage using select case.
5. Write a console program to accept any character from keyboard and display whether it is vowel or not using select case.
6. Windows application for designing GUI with command button, list box and combo box and write a code for adding, deleting items into the list box.
7. Windows application for designing GUI with command button, Textbox, checkbox and ration button. Write a code for changing the font and its style according to checkbox and radio button selection.
8. Develop a form in VB.NET to pick a date from Calendar control and display the day, month, and year details in separate text boxes.
9. Windows application for designing GUI with command button, Progress bar Timer control and write a code for showing the status of application loading into the progress bar.
10. Develop a menu based VB.Net windows application to implement a text editor with cut, copy, paste, save and close operations.
11. Write a program to demonstrate predefined exceptions
12. Write a user defined exception for checking the divide by zero error.

13. Write a program for calculation of employee salary using inheritance.
14. Program for Function and operator overloading.
15. Program for implementing the interfaces.
16. Web application using ASP.Net , Design a page with some controls and display the message in the textbox.
17. Program for validation using coding as well as by validation control of ASP.Net
18. Program for navigation through the pages and web page design using different server controls.
19. Program for preservation of data using cookies and sessions in ASP.Net
20. Program for database connection using ADO.Net and displaying data from database on the forms.
21. Develop a database application to store the details of students using ADO.NET
22. Develop a database application using ADO.NET to insert, modify, update and delete operations.
23. Develop a VB.Net application using Datagrid control to display, add, edit and modify records.
24. Program for connected and disconnected architecture of ADO using different datasets and adapter classes.
25. Create a web application in ASP.NET using three different controls to the ASP.NET page for reserving rooms in hotel. The three controls are a button control, a label control, and a drop-down list control.

(Apart from the above list, concerned teacher can conduct different kinds of programs for the better understanding of the concepts)

Course Title: Lab VI A
Course Code: LCS- 306
Practical based on Digital Image processing

1. program to read and write images
2. Program to show the different types of images
3. Program to show various images in single axis
4. Program to rotate, resize the images
5. Program to read different types of Images (PNG, JPEG, TIF etc)
6. Program to various pixel relationship operation
7. Program to basic Intensity Transformation Function ,
8. Program to Histogram based processing
9. Program for represent the histogram of Images.
10. Program based on spatial Image enhancement
11. Program based on Frequency based image enhancement
12. Program based on morphological operation

13. Program based on Opening and Closing Operation
14. Program based on Thresholding
15. Program based on line, edge detection.
16. Program based on region based segmentation.

(Apart from the above list, concerned teacher can conduct different kinds of programs for the better understanding of the concepts)

Course Title: Lab VI B
Course Code: LCS-306
Practicals based on Mobile Application Development

1. Create “Hello World” application. That will display “Hello World” in the middle of the screen in the red color with white background with change in fonts & styles of text.
2. Create List with string taken from resource folder (res>>value folder). On changing list value change image.
3. Create android UI such that, one screen have radio button of the types of cars. On selecting any car name, next screen should show car details like: name, company name,images if available, show different colors in which it is available.
4. Create android application that will display toast (Message) on android life cycle stages.
5. Create the application that will change color of screen , based on selected option from the menu.
6. Create android application with login module. (Check username & password) on successful login, go to next screen. And on falling login, alert user using Toast.
7. Create android application that will display toast (Message) on specific interval time.
8. Create the android application that calls 3 native applications using intents.
9. Create the android application that will read phonebook contact using content providers and display in list on selecting specific contact makes a call to selected contact.
10. Create android application to take a picture using native application.
11. Create the android application that will send SMS using your android application.
12. Create android background application that will open activity on specific time.
13. Create the android application that will demonstrate shared preferences.
14. Create the android application that will call maps using android application.
15. Create android application to make Insert, Update, Delete and retrieve operation on employee database.

(Apart from the above list, concerned teacher can conduct different kinds of programs for the better understanding of the concepts)

Code: LCS- 307 A	**Third Semester**	**Open Elective**	**Credits:04**
Open Elective : University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses or Intra School or Inter School			

OR

Course Title: Information Technology
Course Code: LCS- 307 B

Objectives:

1. To Aware of potentiality of Information Technology
2. To understand origin of information, transfer of information and use of information
3. To understand the processing of information

Outcomes:

1. Students are able to process the information, use the information effectively
2. Students are used to use technology to fetch the information

Unit I: Introduction

Introduction to Information Technology: quick review on Information Processing, Hardware, Software, Data, Information, Types of Computers: Supercomputers, Mainframes, Servers, Desktop, Network, Workstation, Notebooks, Palmtops, Analog & Digital Computers Analog and Digital Signals, Binary System – Usages, BIT, BYTE, and WORD, FILE.

Unit II: Storage Devices and Storage Media

Storage Devices & Storage Media: Magnetic Storage, Optical Storage, Solid State Storage , Storage Characteristics ,Floppy Discs, Hard Disks, Optical Disks – CD, DVD ,Recording Disks, Pen drive, Blue ray Disc, Flash drive.

Unit III: Computer Languages

Evolution of Computer languages, Machine level language, Assembly level language, High level language and fourth generation languages, translators: Assembler, Compiler and Interpreter

Unit IV: Internet and Search engines

Definition of Internet, Connectivity of Internet, uses of internet, Modems, types of modulations, Wi-fi, VPNs, Search engines, Fetching information using Search Engines, Types of Search Engines. Download accelerators. Different ways to Transfer, share and Receive Information.

Unit V: representing Information Ms-Word

Preparing documents using MS –Word, Formatting a document, inserting a table, formatting a table, use of shape art, shapes, Information of toolbars, menu, bibliography, citation, mail merge.

Reference Books :

1. Introduction to computer , Peter Norton
2. Operating System , Millam Milenkoric
3. Elements of Digital Computers, Thomas Barteee
4. Computer Network, Andrew Tsnninbeum
5. Operating System, Achyut Godbole

Course Title: Seminar presentation activity (SK-03)
Course Code: LCS 308

1. Student should choose the Seminar Topic from the any one core or subject elective course.
2. Student should prepare a seminar report consisting of following points
    i. Introduction
    ii. Need
    iii. Objectives
    iv. Methodology/ Architecture
    v. Conclusion/Application
3. Student should deliver seminar on the selected topic (Time allocated for presentation: 15 Min.)

Course Title: Information Security

Course Code: LCS-401

Objectives:

- To aware the students the various security threats
- To understand the cryptographic algorithms
- To enable the students for monitoring the security threats and securing the data

Outcomes:

- **Students will able to detect the system threats**
- **Students will able to secure the data**
- **Students will able to use allot the digital signatures**

Unit I: Introduction

Overview of Security: Protection versus security; aspects of security–data integrity, data availability, privacy; security problems, user authentication, Orange Book.

Unit II: Security Threats

Program threats, worms, viruses, Trojan horse, trap door, stack and buffer overflow; system threats-intruders; communication threats- tapping and piracy.

Unit III: Cryptography

Substitution, transposition ciphers, symmetric-key algorithms-Data Encryption Standard, advanced encryption standards, public key encryption - RSA; Diffie-Hellman key exchange, ECC cryptography, Message Authentication-MAC, hash functions.

Unit IV: Digital signatures

Symmetric key signatures, public key signatures,message digests, public key infrastructures.

Unit V: Security Mechanisms

Intrusion detection, auditing and logging, tripwire, system-call monitoring, firewall: bastion host, screening routers, Firewall services.

Suggested Readings:

1. **W. Stalling, Cryptography and Network Security Principles and Practices (4th ed.), PHI, 2006.**
2. **C. Pfleeger and SL Pfleeger, Security in Computing (3rd ed.), PHI,2007.**
3. **D. Gollmann, Computer Security, John Wiley and Sons, NY, 2002.**
4. **J. Piwprzyk, T. Hardjono and J. Seberry, Fundamentals of Computer Security, Springer-Verlag Berlin, 2003.**
5. **J.M. Kizza, Computer Network Security, Springer, 2007.**
6. **M. Merkow and J. Breithaupt, Information Security: Principles and Practices, Pearson Education, 2006.**

Course Title: Soft Computing
Course Code: LCS-402
Objective:

- Introduce students to soft computing concepts and techniques
- Foster their abilities in designing and implementing soft computing based solutions for real-world and engineering problems

Outcome:

- Students will be able to use the concepts of Neural Network, Fuzzy Logic and Genetic Algorithm
- Students will be able to used NN tool and FL tool to solve the problem

Unit I: Foundations of intelligent and soft computing

Crisp Sets: an Overview : Fuzzy Sets: Basic Types ,Fuzzy Sets: Basic Concepts , Fuzzy Sets Vs Crisp Sets ,Additional Properties of alpha cuts ,Presentation of fuzzy sets , Extension principle for fuzzy sets

Unit II: Operations on Fuzzy Sets

Fuzzy complements, Fuzzy Union, Fuzzy Intersections, Crisp & Fuzzy Relation, Binary Fuzzy Relation, Binary Relation on single set, Fuzzy Equivalence Relations, Fuzzy Compatibility Relation

Unit III: Introduction to Neural Networks :

Biological Neuron and their Artificial Neuron , McCulloch-Pits Neuron Model ,Perceptron Classification ,Linearly Seperatibility, XOR Problem ,Overview of Neural Network Architecture ,Learning Rules ,Supervised Learning ,Unsupervised Learning ,Perceptron Learning , Reinforcement Learning ,Delta Learning Rule

Unit IV: Multilayer Feed forward

Generalized Delta Learning, Back propagations training algorithm and derivation of weight ,Variant in Back propagations ,Radial Basis Function (RBF) ,Application of BP and RBF N/W

Unit V: Recurrent Network and Unsupervised Learning

Hopfield Network ,Counter propagation networks , Boltzman Machine, Application in Pattern Recognitions.

Suggested readings:

1. George J. Klir, Bo Yuan ,Fuzzy Sets and Fuzzy Logic Theory and Application
2. George J. Klir, Tina A. Floger ,Fuzzy Sets Uncertainty and Information
3. John hertz, Krogh and Richard , Introduction to the Theory of Neural Competition, Addision Wesely
4. Jaeck M. Zurada, Introduction to Artificial Neural Network
5. Koska , Neural Network and Fuzzy System A Dynamic System PHI Edition

Course Title: Major Project development Activity

Course Code: LCS -403

Rules for Project

1. Maximum three students are allowed to do a project
2. Project should be developed at their practical Lab only
3. Students should submit the synopsis/ planning of project on the date of commencement of classes for the IV Semester
4. Students should submit progress report of Project work twice in the month (Six progress reports are expected) though the Project guide
5. The students those interested to do project at Industry level should submit the undertaking of Industry authority for the project
6. Project report should be prepared as per the Appendix A

Course Title: Big Data Analysis
Course Code: LCS 404 A
Objectives :

- To make more effective use of data stored in huge databases and create a clean, consistent repository of data within a data warehouse.
- To discover hidden patterns and knowledge that is embedded in the data using different data mining techniques.
- To use different data mining techniques for taking business decisions designing policies.

Outcome:

- Students will be able to use the tools used for Big Data Analysis
- Students will be able to perform various data mining tasks

Unit I: Data Mining Introduction

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Tasks, Data Mining Task Primitives, Data Mining Vs KDD's, Major issues in DM.

Unit II: Data Warehouse and OLAP Technology for Data Mining

Introduction to Data Warehouse, Data Warehouse Features, Data Warehouse Architecture, Data Warehouse Implementation, OLAP and OLTP, Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization, Data Marts Vs Data warehouse.

Unit III: Classification

Introduction, Classification by Statistical based algorithms, Decision Tree based algorithms, Neural Network based algorithms, Rule based algorithms, Bayesian Classification, Support Vector Machines (SVM).

Unit IV: Association rules and Clustering

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining, Cluster Analysis Introduction : Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Constraint-Based Cluster Analysis, Outlier Analysis

Unit V: Introduction to Web Mining

Introduction: Web Mining- Content Mining, Web Structure Mining, Web Usage Mining, Examples of web mining and applications.

Suggested readings:

1. Arun K Pujari, Data Mining Techniques, 2nd edition, Universities Press.
2. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann

3. K.P.Soman, S.Diwakar, V. Ajay,Insight into Data Mining, PHI, 2008.
4. M.H. Dunham, “Data Mining Introductory and Advanced Topics”, Pearson Education.
5. M Berry and G. Linoff, “Mastering Data Mining”, John Wiley.
6. Pieter Adriaans, Dolf Zantinge , “Data Mining”, Pearson Education Asia
7. Sam Aanhory & Dennis Murray, Data Warehousing in the Real World, Pearson Edn Asia.

Course Title: INTERNET OF THINGS (IoT)
Course Code: LCS 404 B
Learning Objectives:

- To Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved
- To understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules Market forecast for IoT devices with a focus on sensors
- To Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

Outcome:

- Students will able to develop IOT applications
- Students will able to understand the use of sensors and actuator devices
- Students will able to develop projects based on IOT

Unit I – INTRODUCTION

Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device , IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture.

Unit II - SEVEN GENERATIONS OF IOT SENSORS TO APPEAR

Industrial sensors – Description & Characteristics–First Generation – description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Electronics Systems – Description & Characteristics–Sensors' Swarm –description & Characteristics–Printed Electronics – Description & characteristics–IoT Generation Roadmap

Unit III - TECHNOLOGICAL ANALYSIS

Wireless Sensor Structure–Energy Storage, Module–Power Management, module–RF, Module–Sensing Module

Unit IV -IOT DEVELOPMENT EXAMPLES

ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks -Focus on Wearable Electronics

Unit V - PREPARING IOT PROJECTS

Creating the sensor project - Preparing Raspberry Pi - Clayster libraries -Hardware- Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data - Creating the actuator project Hardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states - Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settings - Adding configurable properties - Persisting the settings - Working with the current settings -Initializing the camera

REFERENCES

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Développement Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market
4. Deployment', River Publishers, 2014
5. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.

Course Title: Lab VII

Course Code: LCS 405

Practical Based on Fuzzy logic and Neural Network

1. Introduction to MATLAB
2. Creating Row, Column Vectors &Matrix, Matlab Operators
3. Simple Plotting functions in MATLAB
4. Plotting Activation Functions
5. 2D Classification using Perceptron Learning Rule
6. 3D Classification using Perceptron Learning Rule
7. SDPTA & SCPTA Algorithms
8. Solving XOR Problem by MLP
9. Implement Error Back propagation Training Algorithm
10. Demonstrate RBF function in MATLAB
11. Demonstrate fuzzy union & intersection in MATLAB
12. Demonstrate fuzzy complement operations in MATLAB
13. Write a program for fuzzy membership functions in MATLAB
14. Program to demonstrate pattern recognition application (Digit, Handwritten, fingerprint, etc.)
15. Implement Fuzzy neural network for pattern recognition application

(Apart from the above list, concerned teacher can conduct different kinds of programs for the better understanding of the concepts)

Course Title: Lab VIII A (Big Data analysis)
Course Code: LCS 406

1. Demonstration of Weka 3.6.9 IDE. And tools for data mining
2. Demonstration of preprocessing technique on the existing data set of Weka 3.6.9,
    a. Select weather. nominal data set and preprocess the .ARFF file.
    b. Select weather . numeric data set and preprocess the .ARFF file.
3. Demonstration of classification technique using J48 algorithm on
    a. Select weather. nominal dataset
    b. Select weather. numeric dataset.
    c. Create your own .ARFF file and classify it and visualize the classifier error.
4. Demonstration of classification technique using id3 and naïve bayes algorithm algorithm on
    a. Select weather. nominal dataset
    b. Select weather. numeric dataset.
    c. Create your own .ARFF file and classify it and visualize the classifier error.
5. Demonstration of Association Rule using Apriori algorithm
    a. Dataset test. ARFF using apriori algorithm.
    b. Dataset contact lenses. ARFF using apriori algorithm
6. Demonstration of clustering rule process on dataset iris. ARFF using simple k-means algorithm.
7. Demonstration of clustering rule process on own dataset student.arff using simple k-means algorithms.
8. Demonstration of Predicting the price of house using linear and nonlinear regression algorithm based on different parameters of house.

(Apart from the above list, concerned teacher can conduct different kinds of programs for the better understanding of the concepts)

Course Title: Lab VIII B (IOT)
Course Code: LCS 406

1. Setting an interface between sensors and computer

2. Accessing data from sensor and analyze the data
3. Design and development of any 12 eclipse programs based on LCS 404 B

(Apart from the above list, concerned teacher can conduct different kinds of programs for the better understanding of the concepts)

Code: LCS- 407 A	Fourth Semester	Open Elective	Credits:04
Open Elective : University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses or Intra School or Inter School			

Course Title: Social Media Technology
Course Code: LCS 407 B
Objectives:

- Clearly define social media.
- Communicate a solid understanding of social media and how it has changed over time
- Identify various types of social media
- Identify the basic uses of social media.

Outcome:

- Students are able to create their account on social media
- Students are able to use social media effectively

Unit I: Social Networking basics

Introduction to social networking sites: Facebook, twitter, Linkedin, youtube etc, creating login to social networking sites, setting properties of an account, communication using social networking sites, advantages and disadvantages of social networking sites.

Unit II: Social Media Strategy for organization

Introduction to Social Media, creating and implementing the social media platform, IT infrastructure implication for social media, Portability of social media programs, The power and social Risk of Social Media, Social media strategy, Social media and customer.

Unit III: Marketing and sales in Social Media

Social media and voice of customer, integrating social CRM insights into customer analytics function, Product development and new services to sell, Social community marketing and selling

Unit IV: Customer Service and support with social media

Social media policies, Use of social media in customer service and support, responding to customer complaints, staying out of trouble: complying with FTC disclosers, collaborations and value creation in social media

Unit V: organizational blogs and diaries

Definition of blog, attract blog traffic, weblog, effective communication through weblogs, online diary.

Suggested readings:

1. Stevenson, Social Media Communcations Technology" published by Stevenson Inc..
2. Kevin lee, "Actionable Social Media Strategy" ebook available on https://buffer.com/resources/social-media-strategies

Course Title: SK-04 (Seminar)
Course Code: CS 408

1. Student should choose the Seminar Topic excluding their syllabus
2. Student should prepare a seminar report consisting of following points
    1. Introduction
    2. Need
    3. Objectives
    4. Methodology/ Architecture
    5. Conclusion/Application
3. Student should deliver seminar on the selected topic (Time allocated for presentation: 15 Min.)