॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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प्रस्तुत विद्यापीठीय संकुलातील व संलग्नित महाविद्यालयातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील द्वितीय/तृतीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक २१ सप्टेंबर २०२१ रोजी संपन्न झालेल्या ५२ व्या मा. विद्या परिषद बैठकीतील विषय क्र. ३६/५२–२०२१** च्या ठरावानुसार **प्रस्तुत विद्यापीठीय संकुलातील व संलग्नित महाविद्यालयातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील द्वितीय/तृतीय वर्षाच्या, C.B.C.S. (Choice Based Credit System) Pattern** नुसारच्या खालील विषयाच्या अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्यात येत आहेत.

01. M.Sc. Computer Science II year (Campus & Sub-centre)
02. M.Sc. Computer Application II year (Campus School)
03. MCA (2 year Programmer) II year (III Semester Campus & Affiliated Coll.)
04. MCA (3 year Programmer) III year (Campus & Affiliated Coll.)

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

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पी.जी.–सीबीसीएस अभ्यासक्रम/२०२१–२२/**१५७**

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

दिनांक :०७.१०.२०२१

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) मा. संचालक/प्राचार्य सर्व संबंधित संकुले व महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) अधीक्षक, विज्ञान विद्याशाखा परीक्षा विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यांना देवून कळविण्यात येते की, सदरील परिपत्रकासह अभ्यासक्रम विद्यापीठ संकेतस्थळावर प्रसिध्द करावेत.

Swami Ramanand Teerth Marathwada University, Nanded

(NAAC Re-accredited with 'A' Grade)

Syllabus of Second Year

M.Sc. (Computer Science)

(Campus and Sub Centre)*

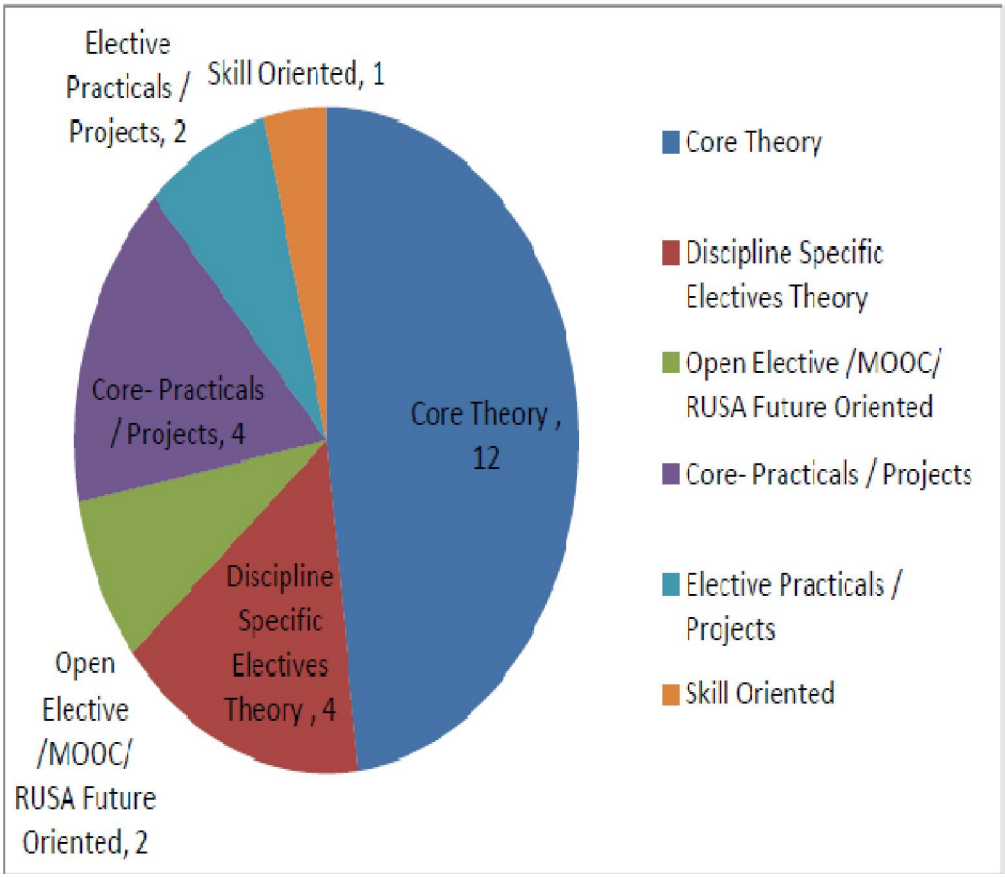
(2 years) (Common CBCS pattern)

To be introduced from AY 2021-2022

*(BoS deserves the rights for minor corrections, typographical errors in this syllabus with due approval of Administrations)

Credit Distribution per Semester:

Sr. No.	Category of courses	Credits
1	Core Theory	12
2	Discipline Specific Electives Theory	04
3	Open Elective /MOOC/ RUSA Future Oriented	02
4	Core- Practicals / Projects	04
5	Elective Practicals / Projects	02
6	Skill Oriented	01
	Total Credits per Semester	25



PEO, PO and CO Mappings

1. **Program Name** : M.Sc.(CS) Common for Campus and Sub Centre

2. **Program Educational Objectives**: After completion of this program, the graduates / students would

PEO I :Technical Expertise	Implement fundamental domain knowledge of core courses for developing effective computing solutions by incorporating creativity and logical reasoning.
PEO II : Successful Career	Deliver professional services with updated technologies in computational science based career.
PEO III :Hands on Technology and Professional experience	Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession.
PEO IV :Interdisciplinary and Life Long Learning	Undergo higher studies, certifications and research programs as per market needs.

3. **Program Outcome(s):** Students / graduates will be able to

   1. **PO1**: Learn, understand and use latest tools in computational world so as to function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary backgrounds in actual software development work
   2. **PO2:** Design component, or processes or programs to meet the needs within realistic constraints.
   3. **PO3:**.Actual hands on technology to understand its working and knowledge of contemporary issues and emerging developments in computing profession
   4. **PO4:** Recognize the need for implementation on applied and interdisciplinary domains / lifelong learning
   5. **PO5:**. Utilize the techniques, skills and modern tools, for actual software development process
   6. **PO6:** Research insights and conduct research in computing environment.

4. **Course Outcome(s):** Every individual course under this program has course objectives and course outcomes (CO). The course objectives rationally match with program educational objectives. The mapping of PEO, PO and CO is as illustrated below

5. **Mapping of PEO& PO and CO**

Program Educational Objectives	**Thrust Area**	**Program Outcome**	**Course Outcome**
PEO I	Technical Expertise	PO1,PO2,PO3	All core courses
PEO II	Successful Career	PO1,PO5,PO6	All discipline specific electives courses
PEO III	Hands on Technology and Professional experience	PO2,PO3	All Lab courses
PEO IV	Interdisciplinary and Life Long Learning	PO4,PO5,PO6	All open electives and discipline specific electives

The detailed syllabus is as below,

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
Third Semester						
1.	**Core Subjects**	CCS-301	Windows Programming	2	2	4
2		CCS-302	Python Programming	2	2	4
3		CCS-303	Software Engineering	2	2	4
Choose any one from below elective subjects						
4	**Elective Subject**	CCS-304 A	Data Sciences	2	2	4
		CCS-304 B	Digital Image Processing			
		CCS-304 C	Object Oriented Modeling Design using UML			
		CCS-304 D	Artificial Intelligence			
		CCS-304 E	Cloud Computing and Virtualization			
		CCS-304 F	Multimedia and Animation			
		CCS-304 G	Linux Administration			
		CCS-304 H	Management Information System			
Practical /Lab						
5	**Lab / Practical**	CCS-305	Lab-7: Windows Programming	1	1	2
		CCS-306	Lab-8: Python Programming	1	1	2
		CCS-307	Lab-9 : Based on Elective	1	1	2
6	**Open Elective**	CCS-308A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR RUSA sponsored Future Oriented Courses	1	1	2
		CCS-308 B	Introduction to Cyber Forensic			
7	**Skill based Activity**	CCS-309	SK-03: Working with FOSS – Free and Open Source Software	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**	CCS-401	Mobile Application Development	2	2	4
2		CCS-402	Compiler Designing	2	2	4
3		CCS-403	Web Technology Tools	2	2	4
Choose any one from below elective subjects						
4	**Elective Subject**	CCS-404 A	Internet of Things (IoT)	2	2	4
		CCS-404 B	Deep Learning			
		CCS-404 C	Advanced Databases and Administration			
		CCS-404 D	Soft Computing			
		CCS-404 E	Natural Language Processing			
		CCS-404 F	Remote Sensing and Geographic Information System			
		CCS-404 G	Software Project Management			
		CCS-404 H	Big Data Analytics			
Practical /Lab						
5	**Lab / Practical**	CCS-405	Lab-10: Mobile Application Development and Web Technology Tools	1	1	2
		CCS-406	Lab-11: Based on Elective	1	1	2
		CCS-407	Lab-12: Major Project development Activity	1	1	2
6	**Open Elective**	CCS-408A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR RUSA sponsored Future Oriented Courses	1	1	2
		CCS-408 B	Introduction to Social Media Technologies			
7	**Skill based Activity**	CCS-409	SK-04 : Soft Skills	1	0	1
	Total credits					**25**

Course Code:	CCS-301	**Course Name:** Windows Programming	**Credits: 4**
Course 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			
Course Outcome:			
• Students will be able to establish the connectivity between form with database • Students will be able to develop application using dotnet			
Unit-1:	**The 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.		06 Lectures
Unit-2:	**Windows Programming using VB .Net**		
	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.		10 Lectures
Unit-3:	**Databases connectivity**		
	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.		08 Lectures
Unit-4:	**Object Oriented Programming**		
	Class and objects, propertied, methods and events, member functions, constructor and destructors, Inheritance, Access modifiers: Private, Public, Protected, Friend, Interfaces, and Polymorphism.		08 Lectures
Unit-5:	**Web Applications**		
	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		08 Lectures needed
Prescribed Book			
1.	Math J. Croush , “ASP.net & VB.net web programming” (Pearson Education) ISBN-10: 0201734400		
Reference Books			
1.	Willis, Cross Land and Blair , “Beginning VB.NET 2003” , Wiley		
2.	Steven Holzner , “Visual Basic .Net Programming Black Book” wiley , 2005		

Course Code:	CCS-302	**Course Name:** Python Programming	**Credits: 4**
Course Objectives:			
• Understanding the python programming • Student will be provided horizontal learning path where they will be able to implement the Open programming i.e. python • Develop the server side scripting and applications			
Course Outcome:			
• Students will be able to develop simple console based application • Students will be able to use various scripts in Threads and other basic unit application • Students will be able to develop complete application			
Unit-1:	**Getting started with python**		
	Python features, python environment, configuration and installation, python, interpreter, interactive mode. Data types and Operations: Core data types, Numbers, Strings, Lists, Dictionaries, Tuples, files and others.		06 Lectures
Unit-2:	**Statement and Syntax**		
	python statements, assignments, expression and prints, conditional statements if, multiway branching, Looping Controls: while, for, loop coding techniques. Iterators, Lists Comprehension, Range iterators, the map, zip and filter iterators, multiple vs single iterator, generators, timing iterators. Functions: scope, arguments, types of functions, recursion, function objects, anonymous function, Units.		10 Lectures
Unit-3:	**Thread and Integrated Development Environment(IDE)**		
	Introduction to Threads, thread organization, thread architectures, starting new thread, thread modules, Integrated Development Environment (IDE): Introduction, Layout Management, Widgets, Menus and Toolbars, Dialog boxes, Drawings, Nibbles. Database Programming using python (MySql): Python Database Interfaces, and APIs, Database Connections, Creating Table, Insert Operation, Read operation, Update and Delete, Operation, Performing Transactions, Commit & Rollback Operations, Handling Errors		08 Lectures
Unit-4:	**Object Oriented Programming**		
	class statement, constructors and expressions, methods, Inheritance, Multiple inheritance (Is-a, Has-a), static, decorators, meta classes, Namespaces. Operator overloading: indexing and, slicing, memberships, attribute reference. Delegation, Wrappers in Python		08 Lectures
Unit-5:	**Exception Handling**		
	Exceptions, default exception handler, catching exception, raising exception, user defined exceptions, termination action. Exception coding: try statement, try else clause, try/finally statement, unified try/except/finally statement, assert statement.		08 Lectures needed
Prescribed Book			
1.	Learning Python, 5th Edition, powerful Object-Oriented Programming, By Mark Lutz, and Publisher: O'Reilly Media, date: June 2013		
Reference Books			
1.	Python Book(http://upload.wikimedia.org/wikipedia/commons/9/91/ Python_ Programming.pdf) http://pythonbooks.revolunet.com/		

Course Code:	CCS-303	**Course Name:** Software Engineering	**Credits: 4**
Course Objectives:			
• To aware the software Engineering principles • To understand the software development and testing process, verification and validation of software product			
Course Outcome:			
• Students are able to develop software using software engineering principles • Students are able to test the software as well as quality of software product			
Unit-1:	**Introduction**		
	Introduction: Software, Software Characteristics, Software Applications, Software Myths, Software Engineering, Generic View of Software, Software Paradigms: Linear Sequential Model or Classic Life Cycle, Prototyping, Evolutionary Software Process Model, 4 GT, RAD		08 Lectures
Unit-2:	**Software process and project metrics**		
	Measures, metric and indicators, Software Measurement, Reconciling different metric approaches, Metrics for software quality, Integrating metrics within the software Engineering process.		10 Lectures
Unit-3:	**Design Engineering and User Interface Design**		
	Design process and design quality, design concepts, design models, The Golden rules, User interface analysis and design, interface design activities		08 Lectures
Unit-4:	**Risk Analysis**		
	Definition of Risk, Types of Risk, Reactive Vs. proactive risk, Risk Analysis: risk identification, projection, Assessment and Management		08 Lectures
Unit-5:	**Software Testing Techniques**		
	Testing-Introduction to Testing, Testing Objectives, white box: Basis path Testing, Control Structure Testing, black box: Equivalence Partitioning, Boundary Value Analysis, Comparison Testing, Orthogonal Array, Testing Strategies: Validation and Verification.		08 Lectures needed
Prescribed Book			
1.	Software Engineering a Practitioner's Approach Roger S. Pressman 5th Ed. TMH		
Reference Books			
1.	Software Engineering Richard Fairley Tata McGraw Hill		
2.	Software Engineering David Gustafson		
3.	Practical Guide in Structured System Design Meilier Page		
4.	Software Project Management - Jalote		

Course Code:	CCS-304 A	**Course Name:** Data Sciences	**Credits: 4**
Course Objectives:			
• To understand the Concept of descriptive statistics, correlation and regression • To apply the data science methods for scientific computing			
Course Outcome:			
• Students are able to do scientific computation using data science tools • Students are able to perform the advanced mathematical operations			
Unit-1:	**Introduction**		
	Computer science, Data Science and Real Science, Properties of data : Structured Vs unstructured data, Quantitative Vs Categorical data, Big data Vs little data. Classification and regression.		08 Lectures
Unit-2:	**Mathematical Preliminaries**		
	Probability: Probability Vs Statistics, Compound event and independence, Descriptive statistics: Centrality measures, variability measures, interpreting variance, Correlation Analysis: Correlation coefficients, The power and significance of correlation. Logarithms: Logarithm and multiplying probability, Logarithms and ratios		10 Lectures
Unit-3:	**Data Munging**		
	Language for data Science, Standard data formats, Collecting data, cleaning data, exploratory Data analysis, developing a visual aesthetic, Chart types, data models: Baseline models, Evaluating models		08 Lectures
Unit-4:	**Linear Algebra**		
	Interpreting linear algebraic formulae, geometry and vectors, Matrix operations, factorizing matrix, Eigen values, Eigen vectors and Eigen value decomposition.		08 Lectures
Unit-5:	**Linear Regression**		
	Linear regression, error in Linear regression, finding the optimal fit, better regression models: removing outliers, fitting non linear functions, feature and target scaling, dealing with highly correlated features, regression as parameter fitting, Ridge regression, Lasso regression, Introduction to logistic regression		08 Lectures needed
Prescribed Book			
1.	Steven S. Skiena, "The data science design manual" springer pub. 2017, ISBN 978-3-319-55444-0 (eBook)		
Reference Books			
1.	Software Engineering Richard Fairley Tata McGraw Hill		
2.	Software Engineering David Gustafson		

Course Code:	CCS-304 B	**Course Name:** Digital Image Processing	**Credits: 4**
Course Objectives:			
• 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			
Course 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-1:	**fundamentals of Digital Image Processing**		
	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.		08 Lectures
Unit-2:	**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.		10 Lectures
Unit-3:	**Morphological Image Processing**		
	Erosion and Dilation, Opening and Closing, Gray-Scale Morphology, Some Basic Morphological Algorithms		08 Lectures
Unit-4:	**Image Segmentation**		
	Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds		08 Lectures
Unit-5:	**Object Representation, Description and Recognition**		
	Representation, Boundary Descriptors, Region Descriptors, Pattern and Pattern Classes, Matching.		08 Lectures needed
Prescribed Book			
1.	A.K. Jain, PHI, New Delhi, “Fundamentals of Digital Image Processing “,2012		
Reference Books			
1.	Chanda Dutta Magundar, “Digital Image Processing and Applications”, Prentice Hall of India, 2000		
2.	Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy, “Image Processing Analysis and Machine Vision” (1999)		
3.	Rafael C Gonzalez, Richard E Woods 2nd Ed., “Digital Image Processing” Pearson Education2003		
4.	William K Pratt, “Digital Image Processing”, John Willey (2001)		

Course Code:	CCS-304 C	**Course Name:** Object Oriented Modeling Design using UML	**Credits: 4**
Course Objectives:			
• To understand the Object oriented Analysis and design concept • To acquire the skills to draw the UML diagrams for the problems • To represent the activities using activity daigagram			
Course Outcome:			
• Students will be able to understand the UML, use case ,activity diagrams and notations • Students will be able to represents the problems using UML			
Unit-1:	**Object model**		
	The object model: the evolution of the object model, foundations of the object model, elements of the object model, applying the object model. Object Oriented Paradigms: Object oriented Analysis, Object oriented Design, Object Oriented Programming		08 Lectures
Unit-2:	**Class and object**		
	Classes and Objects: the nature of an object, relationships among objects, the nature of a class, relationships among classes, the interplay of classes and objects, on building quality classe. objects.Classification: the importance of proper classification, identifying classes and objects, key abstractions and mechanisms.		10 Lectures
Unit-3:	**OOAD –UML basic Notations and structured diagram**		
	Class, object, Components, interface, package, relationship. UML Diagram: class diagram, object diagram, component diagram, deployment diagram		08 Lectures
Unit-4:	**UML behavioural diagram**		
	Use case model, use case diagrams, interaction diagrams, sequence diagrams, collaboration diagrams, activity diagrams.		08 Lectures
Unit-5:	**OOAD – Object Oriented Design**		
	System design, object oriented decomposition, identifying currency, identifying events, controlling events, object design, packaging classes, design optimization, design documentation.		08 Lectures needed
Prescribed Book			
1.	James Rumbaugh, Ivar Jacobson, Graddy Booch, “The unified Modelling Language reference manual”		
Reference Books			
1.	Grady Booch, Object-Oriented Analysis and Design with Applications		
2.	Ali Bahrami, Object Oriented Systems Development		
3.	Berd Oestereich,Developing software with UML – OOAD in practice		
4.	Sarnath Ramnath, Brahma Dathan, Object-Oriented Analysis and Design		

Course Code:	CCS-304 D	**Course Name:** Artificial Intelligence	**Credits: 4**
Course Objectives:			
• To understand the concept of Artificial Intelligence • To study the Heuristic Search Techniques for problem solving • To study knowledge representation and logic			
Course 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-1:	**Introduction**		
	What is Artificial Intelligence: The AI Problems, Underlying Assumptions, AI Techniques		08 Lectures
Unit-2:	**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*		10 Lectures
Unit-3:	**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.		08 Lectures
Unit-4:	**Weak and Strong slots and Filler Structure**		
	Weak slots and Filler Structure: Semantic Nets and Frames Strong slots and Filler Structure: Conceptual Dependency, Scripts.		08 Lectures
Unit-5:	**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		08 Lectures needed
Prescribed Book			
1.	Elaine Rich and Kerin Knight , “An Introduction to Artificial Intelligence”, McGraw Hill, 4th ed., 2001		
Reference Books			
1.	Russell and Norvig , “Artificial Intelligence: a modern approach”, PHI , 3rd ed, 2013		
2.	Edward A. Bender “Mathematical Methods in Artificial Intelligence”, Wiley , 1996		
3.	Patrik Henry Winston “ Artificial Intelligence”, 3rd ed., ISBN-10: 0201533774, 2004		
4.	Woolbridge, “Reasoning about Intelligent Agents”, ISBN-10: 0262515563		

Course Code:	CCS-304 E	**Course Name:** Cloud Computing and Virtualization	**Credits: 4**
Course Objectives:			
• To understand the concepts of cloud computing • To aware the services provided by cloud computing • To study the security issues of cloud computing			
Course Outcome:			
• Students will be able to use cloud services • Students will be able to establish the security system for cloud computing			
Unit-1:	**Introduction**		
	Cloud Computing: Definition, Cloud Architecture, Cloud Storage, Advantages and Disadvantages of Cloud Computing, Companies in the Cloud Today, Cloud Services, **Cloud Types:** The NIST Model, The Cloud Cube Model, Deployment Models, Service Models Cloud **Computing, Service Models:** Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS).		08 Lectures
Unit-2:	**Developing Cloud Services**		
	Web-Based Application – Pros and Cons of Cloud Service Development , Types of Cloud Service Development – Software as a Service, Platform as a Service, Web Services : On-Demand Computing, Discovering Cloud Services, Development Services.		10 Lectures
Unit-3:	**Cloud Computing for Everyone**		
	Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation.		08 Lectures
Unit-4:	**Using Cloud Services**		
	Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files.		08 Lectures
Unit-5:	**Cloud Security and Challenges**		
	Cloud security architecture: Architectural Considerations- General Issues, Trusted Cloud computing, Identity Management and Access control Identity management, Access control, Autonomic Security. C**hallenges:** Virtualization security management virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.		08 Lectures needed
Prescribed Book			
1.	Barrie Sosinsky, “Cloud Computing Bible”, Wiley India pub		
Reference Books			
1.	Dinakar Sitaram, “Moving to The Cloud” , Elsevier, 2014		
2.	Danc.Marinercus, “Cloud Computing Theory And Practice”, Elsevier, 2013		
3.	Judith Hurwitz, Robin Bloor, Marcia Kaufman, and Dr. Fern Halper, “Cloud Computing for Dummies” , Wiley Publishing, 2010		
4.	Michael Miller, “Cloud computing” , Pearson Pub		

Course Code:	CCS-304 F	**Course Name:** Multimedia and Animation	**Credits: 4**
Course Objectives:			
• To understand File formats and data standard used in Multimedia • To acquire the skill of animation of an object • To study the Input output technology of Multimedia			
Course Outcome:			
• Students will be able to Concept of File formats • Students will be able to do the animation • Students will able to compress the data used in multimedia without losing the properties			
Unit-1:	**Introduction**		
	Definition of multimedia, Multimedia Basics, Where to use Multimedia, Multimedia Elements, Multimedia Application, Virtual Reality, Delivering Multimedia, Multimedia Workstation Architecture, High resolution Graphic displays; Network architecture for Multimedia systems.		08 Lectures
Unit-2:	**Animation Objects and effects**		
	Text, Image and Sound Fundamentals: About Fonts and Face, Hypermedia and Hypertext. Images: Making Still Images, Bitmaps - 1 bit images - 8-bit gray level images - 8-bit color images- Dithering- 24 bit color images - Vector Drawing - Vector-Drawn Objects vs. Bitmaps. Sound: MIDI Audio - MIDI vs. Digital Audi; Multimedia System Sounds; Adding Sound to Your Multimedia Project, Audio Recording. **Animation:** The Power of Motion- Principles of Animation - Animation by Computer – Animation Techniques, Types of Animation.		10 Lectures
Unit-3:	**Data Compression**		
	Need for Data compression - General Data compression Scheme – Compression standards - Non-lossy compression for images - Lossy compression for Photographs and video, Hardware Vs Software Compression, **:** Basics of Binary image compression		08 Lectures
Unit-4:	**Data and file format Standards**		
	Popular File Formats - RTF, RIFF, GIF, PNG, TIFF, MIDI, JPEG, JFIF, AVI,WAV, BMP,WMF, MIX, MPEG standards – TWAIN		08 Lectures
Unit-5:	**Multimedia Input output technologies**		
	Limitations of Traditional input devices - Multimedia input output devices - PEN input - Working of Electronic Pen - Video and image display systems – Video display technology standards; CRT - display terminology, Flat panel display system.		08 Lectures needed
Prescribed Book			
1.	Bufford: Mult imedia Systems, Addison Wesley		
2.	Jeffcoate : Multimedia in Pract ice, Prent ice-Hall		
Reference Books			
1.	Fundamental of Mult imedia - Ze-Nian Li & M. S. Drew		
2.	Mult imedia Systems Design - Prabhat k.Andleigh, Kiran Thakra		
3.	Computer Graphics Mult imedia and Animat ion - Malay K. Pakhira PHI		

Course Code:	CCS-304 G	**Course Name:** Linux Administration	**Credits: 4**
Course Objectives:			
• To understand File formats and data standard used in Multimedia • To acquire the skill of animation of an object • To study the Input output technology of Multimedia			
Course Outcome:			
• Students will be able to Concept of File formats • Students will be able to do the animation • Students will able to compress the data used in multimedia without losing the properties			
Unit-1:	**Introduction**		
	Installation of Linux, System recovery, File system, system calls, internal commands of Linux: Date, Time,cp, cal, rd, md, cd		08 Lectures
Unit-2:	**Component of Process**		
	PID, PPID, UID, EUID, GID, EGID, The lifecycle of Process, The /Proc file system, The working of commands top, nice ,renice, ps, dig		08 Lectures
Unit-3:	**File system**		
	File system mounting and unmounting, File types: regular files, directories, character and block device files, names pipes. File attributes: permission bits, setuid and set gid bits,		08 Lectures
Unit-4:	**Linux administration**		
	Adding user, removing user, disable login, allocating permissions to user, managing user with system specific tools. Software Configuration Management: diskless client, Package management, Localization and configuration, configuration management tools. Linux commands: grep, man, kill, whereis, service,df,du,passwd,lpr,ifconfig,netstat,nslookup,wall, talk,free, cat, tar,		08 Lectures
Unit-5:	**Domain Name System (DNS) in Linux**		
	DNS namespace, How DNS works, DNS database: Resource record, SOA record, NS record, Mx record, PTR record, Cname record, IPV6 resource record. BIND client issues, BIND server configuration,		08 Lectures needed
Prescribed Book			
1.	Evi Nemeth , Garth Snyder, Trent R. Hein, Ben Whaley “Unix and Linux administration handbook” 4th Ed. ,PHI		
Reference Books			
1.	Evi Nemeth , Garth Snyder, Trent R. Hein “Unix and Linux administration handbook” 2th Ed. ,PHI		

Course Code:	CCS-304 H	**Course Name:** Management Information System	**Credits: 4**
Course Objectives:			
• To understand the concepts of Information System • To aware how to Manage the information • To study the security issues of MIS			
Course Outcome:			
• Students will be able to understand the MIS • Students will be able to establish the security system for MIS • Students will understand the quality of information			
Unit-1:	**Evolution of MIS**		
	Concepts, framework for understanding and designing MIS in an Organization. **Organization and Information Systems:** The Organization: Structure, Managers and activities, Data, information and its attributes , The level of people and their information needs , Types of Decisions and information , Information System, categorization of information on the basis of nature and characteristics.		08 Lectures
Unit-2:	**Information System**		
	Transact ion Processing System (TPS), Office Automat ion System, (OAS), Management Informat ion System (MIS), Decision Support System (DSS) and Group, Decision Support System (GDSS), Expert System (ES), Executive Support System (EIS or ESS).		10 Lectures
Unit-3:	**Manufacturing and service system**		
	Information systems for Accounting, Finance, Production and Manufacturing, Marketing and HRM functions - IS in hospital, hotel, bank. **Enterprise System**: Enterprise Resources Planning (ERP): Features, selection criteria, merits, issues and challenges in Implementation - Supply Chain Management (SCM): Features, Modules in SCM -Customer Relationship Management (CRM): Phases.		08 Lectures
Unit-4:	**Choice of IT**		
	Nature of IT decision; Strategic decision; Configuration design and evaluation Information technology implementation plan.		08 Lectures
Unit-5:	**Security and Ethical Challenges**		
	Ethical responsibilities of Business Professionals – Business, technology. Computer crime – Hacking, cyber theft, unauthorized use at work. Piracy – software and intellectual property. Privacy – Issues and the Internet Privacy. Challenges – working condition, individuals. Health and Social Issues, Ergonomics and cyber terrorism.		08 Lectures needed
Prescribed Book			
1.	Management Informat ion Systems, Kenneth J Laudon, Jane P. Laudon, Pearson/PHI		
Reference Books			
1.	Management Informat ion Systems, W. S. Jawadekar, Tata McGraw Hill		
2.	Introduction to Informat ion System, James A. O' Brien, Tata McGraw Hill.		
3.	Management Informat ion Systems, S.Sadagopan, PHI		

Course Code:	CCS-305	Course Name: Lab-7: Windows Programming	Credits: 2
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments: As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCS-306	Course Name: Lab-8: Python Programming	Credits: 2
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments: As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCS-307	Course Name: Lab-9: Based on Elective	Credits: 2
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments: As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCS-308 A	Course Name: Open Elective	Credits: 2
Open Elective: University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School			

OR

Course Code:	CCS-308 B	Course Name: Introduction to cyber forensic	Credits: 2
Course Objectives:			
• Understanding vulnerabilities in computer • Computer forensics • Understand security protocols			
Course Outcome:			
• Students completing this course will be able to: • Develop strategies to analyze security loop holes • Develop and understand security protocols in computer and networking			
Unit-1:	**Computer Forensic Fundamentals**		
	Introduction to Computer Forensics and objective, the Computer Forensics Specialist, Use of Computer Forensic in Law Enforcement, Users of Computer Forensic Evidence. Types of Computer Forensics Technology: Types of Military, Computer Forensic Technology, Types of Business Computer Forensic Technology.		04 Lectures

Unit-2:	**Security and Wireless Technologies**	
	Types of Computer Forensics Systems, Study different Security System: Internet, Intrusion Detection, Firewall, Storage Area, Network Disaster Recovery, Public Key Infrastructure, Wireless Network, Satellite Encryption, Instant Messaging (IM).	4 Lectures
Unit-3:	**Data Recovery**	
	Data Recovery and Backup, Role of Data Recovery, Hidingand Recovering Hidden Data. Evidence Collection: Need to Collect the Evidence, Types of Evidences, The Rules of Evidence, Collection Steps.	04 Lectures
Unit-4:	**Network Forensics**	
	Sources of Network Based Evidence, Principles of Internetworking, Internet Protocol Suite. Evidence Acquisition: Physical Interception, Traffic Acquisition Software, Active Acquisition. Network Intrusion Detection and Analysis: NIDS/NIPS, Functionality, Modes of Detection, Types of NIDS/NIPS,NIDS/NIPS Evidence Acquisition	04 Lectures
Unit-5:	**Network Devices and Mobile Phone Forensics:**	
	Sources of Logs, Network Architecture, Collecting and Analyzing Evidence, switches, routers, firewalls, interfaces Web Proxies: Need to Investigate Web Proxies, Functionality, Evidence, Squid, WebProxy Analysis, Encrypted Web Traffic. Mobile Phone Forensics: Crime and Mobile, Phones, Voice, SMS and Identification of Data Interception in GSM, Mobile, Phone Tricks, SMS Security, Mobile Forensic.	04 Lectures needed
Prescribed Book		
1.	Computer Forensics Computer Crime Scene Investigation, John R. Vacca,Second Edition, 2005	
Reference Books		
1.	Network Forensics, Sherri Davidoff, Jonathan HAM, Prentice Hall, 2012	
2.	Mobile Phone Security and Forensic: A Practical Approach, Second Edition, Iosifl. Androulidkis,Springer, 2012	
3.	"Digital forensics: Digital evidence in criminal investigation",AngusM.Marshall,John - Wiley and Sons, 2008	

Course Code:	**CCS-309**	**Course Name:** Skill based activity SK-03	**Credits: 1**
Working with FOSS- Free and Open Source software			

Fourth Semester

Course Code:	CCS-401	**Course Name:** Mobile Application Development	**Credits: 4**
Course Objectives:			
• To aware the programming environment of Android Studio • To develop an application using android studio • To connect form with database using android studio			
Course Outcome:			
• Students are able to Andriod apps • Students are able to understand how to convert existing apps into android app			
Unit-1:	**Introduction**		
	Introduction to handheld devices (Palm, Pocket Pc,Symbian OS smart phones, MS windows based smart phones, iphone etc.),features of handheld devices, Device Applications Vs Desktop application, overview of application development platforms (OS-Palm , Symbian, BlackBerry, Windows CE, OS for iphone, Android), Programming Languages (C/C++, JAVA), IDE tools. Comparative study of all versions of Android, Introducing Services, Using Toast, Notifications, Alarms.	08 Lectures
Unit-2:	**Android Operating System Installations**		
	Background, Android SDK Features, 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.	10 Lectures
Unit-3:	**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.	08 Lectures
Unit-4:	**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.	08 Lectures
Unit-5:	**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, 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	08 Lectures needed
Prescribed Book			
2.	Reto Meier. Professional Android Application Development, Wrox Publications ISBN: 978-0-470-34471-2.	
Reference Books			
1.	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 Code:	CCS-402	**Course Name:** Compiler Designing	**Credits: 4**
Course Objectives:			
• To understand the phases of Compiler • To aware the Finite Automata and Lexical Analysis • To understand Parsing Techniques			
Course 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-1:	**Introduction**		
	Compiler Basics, Issues in Compilation, Phases of Compilation: the Analysis – Synthesis Model, Compiler Construction Tools		08 Lectures
Unit-2:	**Designing a lexical Analyser**		
	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.		10 Lectures
Unit-3:	**Designing a 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.		08 Lectures
Unit-4:	**Intermediate-Code Generation**		
	Need For Intermediate Code Generation, syntax trees, three-address code, translation of expressions, stack allocation of space, heap management, storage allocation for arrays, strings and records, Intermediate Forms: Polish Notation, Quadruples, Triples.		08 Lectures
Unit-5:	**Code optimization**		
	Introduction, need for code optimization, 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.		08 Lectures needed
Prescribed Book			
1.	Aho A.V., R. Sethi and J.D. Ullman, Compiler Principle, Techniques and Tools , Addison Wesley.		
Reference Books			
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.	Barret, Couch, Compiler Construction Theory and Practice, , Asian Student Edition		
4.	Dhamdhere D.M, "Compiler Construction Principle and Practice", McMillan India		

Course Code:	CCS-403	**Course Name:** Web Technology Tools	**Credits: 4**
Course Objectives:			
• To improve the web designing skills of students as per the standards • To understand and use CSS and Client side scripting languages to create professional deigning of web • Develop the server side scripting			
Course Outcome:			
• Students will be able to develop the web pages • Students will be able to use various scripts in web pages • Students will be able to develop complete web application			
Unit-1:	**Introduction**		
	Introduction to basic concept, Internet domains, Client IP address, web client and server, The Phases of Web Site Development Creating Internet World Wide Web pages- HTML - Hypertext Markup Language , Basic HTML Concepts, Lists, Tables, linking documents frames, adding Graphics and multimedia. HTML Forms.		08 Lectures
Unit-2:	**CSS**		
	Introduction To Style sheet, types of style sheets- Inline, External, Embedded CSS, color and background, text formatting attributes, CSS Border, margin properties, Positioning Use of classes in CSS, Div and span tag, Classes, use of external style sheets.		10 Lectures
Unit-3:	**Java Script**		
	Intro to script, types, intro of JavaScript, JavaScript identifiers, operators, control & Looping structure, Intro of Array, Array with methods, form object, Math, String and Date Objects with methods User defined & Predefined functions, DOM objects, Window Navigator, , Event handling, Validations On Forms, introduction to cookies.		08 Lectures
Unit-4:	**XML**		
	Intro & features of XML, XML writing elements, attributes etc. XML with CSS, DSO, XML Namespaces XML DTD, XML Schemas, Writing Simple sheets using XSLT, SAX & DOM Parsers, SOAP Introduction.		08 Lectures
Unit-5:	**PHP**		
	Introduction, apache/IIS installation, setting and configuration PHP to work under apache/IIS, writing PHP, data types, variables, constants operators, arrays, loops, functions PHP Server variables, working with forms		08 Lectures needed
Prescribed Book			
1.	Ivan Bayross, "Web enabled commercial application development using HTML, DHTML, JavaScript, PERL-CGI", BPB pub., 2nd Ed., 2000		
Reference Books			
1.	Joe Fawcett,Danny Ayers,Liam R.E. Quin, "Beginning XML" Wrox Press, 5th Ed., 2012		
2.	Deitel & Deitel, "XML how to program", Pearson, 2000		
3.	Hofstetter fred , "Internet Technology at work", Osborne pub. , ISBN : 9780072229998, 2004		
4.	Ivan Bayross , "HTML, DHTML, JavaScript, Perl & CGI" ,BPB pub. 3rd Ed.,2004		

Course Code:	CCS-404 A	**Course Name:** Internet of Things (IOT)	**Credits: 4**
Course 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. • To Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi			
Course Outcome:			
• Students will able to understand the use of sensors and actuator devices • Students will able to develop projects based on IOT			
Unit-1:	**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.		08 Lectures
Unit-2:	**Seven generation of IOT Sensor to appear**		
	Industrial sensors – Description & Characteristics–First Generation – description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors : Description & Characteristics, Sensors' Swarm: –description & Characteristics, Printed Electronics : Description & characteristics, IoT Generation Roadmap.		10 Lectures
Unit-3:	**Technological Analysis**		
	Wireless Sensor Structure–Energy Storage, Module–Power Management, module–RF, Module–Sensing Module.		08 Lectures
Unit-4:	**IOT Development Examples**		
	ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks - Focus on Wearable Electronics.		08 Lectures
Unit-5:	**Preparing IOT Projects**		
	Creating the sensor project - Preparing Raspberry Pi - Clayster libraries -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 .		08 Lectures needed
Prescribed Book			
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		
Reference Books			
1.	Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015		
2.	OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014		
3.	N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014		

Course Code:	CCS-404 B	**Course Name:** Deep Learning	**Credits: 4**
Course Objectives:			
• To Understanding of concept of deep learning • To establish deep network, convolutional network, Hybrid deep networks • To dealt with various leaning algorithms for deep models			
Course Outcome:			
• Students will able to establish deep Networks • Students will able to understand learning mechanism in Deep networks • Students will able to apply deep learning models to solve the problems			
Unit-1:	**Introduction**		
	Definitions and background, three class of deep learning network: deep network for supervised, Deep network for unsupervised and hybrid deep networks, Learning Algorithms, Bayesian Statistics		08 Lectures
Unit-2:	**Deep Forward Network**		
	Learning XOR, Gradient based learning, architecture design, hidden units, Back-propagation algorithm		10 Lectures
Unit-3:	**Regularization of Deep learning**		
	Parameter Norm Penalties, Norm penalties as Constrained Optimization, Regularization and Under Constrained Optimization, Dataset Augmentation, Noise robustness, semi supervised learning, Multitask learning, Early Stoping, Sparse representation, Dropout, Adversarial Training, Tangent Distance, Tangent prop		08 Lectures
Unit-4:	**Optimization for Training Deep Models**		
	How learning differs from pure optimization, Challenges in Neural Network Optimization, Basic Algorithms, Algorithms for adaptive learning rates, Approximate second –order methods, Optimization Strategies and meta algorithms		08 Lectures
Unit-5:	**Convolutional Networks**		
	The convolution Operation, Motivation, Pooling, Convolution and Pooling as infinitely strong prior, variants of basic convolution function, Structured output, data types, Efficient Convolution algorithm, Random or Unsupervised features		08 Lectures needed
Prescribed Book			
1.	Ian Goodfellow, Yoshua Bengio, Aron Courville, “Deep Learning” 2017, MIT		
Reference Books			
1.	Li Deng, Dong yu, “Deep Learning Methods and Applications”, 2014		

Course Code:	CCS-404 C	**Course Name:** Advanced Databases and Administration	**Credits: 4**
Course Objectives:			
• To acquire the new developments and emerging trends in database technology • To Interpret and explain the impact of emerging database standards • To develop practical expertise using these developments in databases to fulfil software industry requirements. • To acquire the skill of database administration			
Course Outcome:			
• Students will be able to perform operations on database using oracle 9i or 10g • Students will be able to prepare normalize database • Students will be able to prepare a serializable schedule			
Unit-1:	**Introduction**		
	Database, Parallel database, Parallel database architecture, I/O parallelism, Inter-query and Intra-query parallelism, parallel query evaluation, Distributed Databases, Advantages & Disadvantages of Distributed Databases, Difference between Parallel and distributed, Comparison of Homogeneous and Heterogeneous Databases, Distributed transactions, Concurrency control in distributed databases.		08 Lectures
Unit-2:	**Transaction Management and Concurrency control**		
	Concept of transaction, ACID properties, States of transaction, Schedules, Serializibility, and Concurrency control, Locking techniques, Deadlocks, Time stamp based protocols.		10 Lectures
Unit-3:	**Crash Recovery and Backups**		
	Failure classifications, storage structure, Recovery & Atomicity, Log based recovery, Recovery from concurrent transactions, Database backup from failures, Remote Backup System		08 Lectures
Unit-4:	**Security and Privacy**		
	Database security issues, Access control based on grant & revoking privilege, Mandatory access control and role based access control for multilevel security, Encryption & public key infrastructures		08 Lectures
Unit-5:	**Database Administration**		
	Types of database users, Tasks of Database Administrator, Administrative Previllages, Selecting an Authentication method for database administrator, Managing Client-server Processes, Managing memory,Managing users, Securing database, Monitoring Database Operations, Managing Dignostic Data		08 Lectures needed
Prescribed Book			
1.	Abraham Silberschatz, Henry Korth, S. Sudarshan,Database Systems Concepts, 6th Ed. McGraw-Hill		
Reference Books			
1.	Bipin Desai, “Database Management Systems”, Galgotia Pub.		
2.	C.J.Date, “ Introduction to database systems”, Pearson.		
3.	Chakrabarti, “Advanced Database Management system”, ISBN: 9788177228021, Wiley India		
4.	Korth, “Database system concept” ,TMH,5th Ed.		
5.	Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, TMH		
6.	“Oracle Database-Administrators guide” published by oracle press, 2015		

Course Code:	CCS-404 D	**Course Name:** Soft Computing	**Credits: 4**
Course Objectives:			
• 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			
Course 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-1:	**Introduction**		
	What is soft computing, Soft computing vs Hard Computing, need of soft computing, Soft computing tools: Artificial Neural Network, Fuzzy Logic, Genetic Algorithms. Hybrid Systems: Neuro-fuzzy, fuzzy-ga, Neuro-ga, neuro-fuzzy-ga. Applications of Soft Computing.		08 Lectures
Unit-2:	**Fuzzy Logic basics**		
	Crisp Sets: an Overview, Operations, relations, Properties Fuzzy Sets: Basic Concepts , Fuzzy Sets Vs Crisp Sets ,Additional Properties of alpha cuts ,Presentation of fuzzy sets , Extension principle for fuzzy sets, Degree of membership, membership functions		10 Lectures
Unit-3:	**Operations on Fuzzy set**		
	Fuzzy complements, Fuzzy Union, Fuzzy Intersections, Crisp & Fuzzy Relation, Binary Fuzzy Relation, Binary Relation on single set, Fuzzy Equivalence Relations, Fuzzy Compatibility Relation		08 Lectures
Unit-4:	**Introduction to Neural Network**		
	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		08 Lectures
Unit-5:	**Multi Layer and Recurrent Neural Network**		
	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, Hopfield Network , Boltzman Machine, Application in Pattern Recognitions		08 Lectures needed
Prescribed Book			
1.	George J. Klir, Bo Yuan ,Fuzzy Sets and Fuzzy Logic Theory and Application		
2.	Jaeck M. Zurada, Introduction to Artificial Neural Network		
Reference Books			
1.	George J. Klir, Tina A. Floger ,Fuzzy Sets Uncertainty and Information		
2.	S.N. Shivanandam, S. Sumathi, S.N. Deepa, " Introduction to soft computing"		
3.	John hertz, Krogh and Richard , Introduction to the Theory of Neural Competition, Addision Wesely		
4.	Koska , Neural Network and Fuzzy System A Dynamic System PHI Edition		
5.	Rajshekharan, Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms, EEE		

Course Code:	CCS-404 E	**Course Name:** Natural Language Processing	**Credits: 4**
Course Objectives:			
• 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			
Course 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-1:	**Natural Language Processing –Introduction**		
	Background study of NLP, Study of human language, ambiguity and uncertainty in Language, dialect of languages, problems in Natural language processing.		08 Lectures
Unit-2:	**NLP-Linguistic Resources**		
	Corpus, Elements of corpus design, Tree bank corpus, Types of tree bank corpus, applications of tree bank corpus, propBank corpus, verbnet(VN), Wordnet		10 Lectures
Unit-3:	**Word Level Analysis**		
	Regular expressions, Properties of regular expression, regular sets and their properties, Finite Automata, Relation between finite automata, regular grammar and regular expression, Morphological parsing, types of Morpheme.		08 Lectures
Unit-4:	**Natural Language Processing- Syntax Analysis**		
	Concept of Parser, Types of Parsing, Types of Derivation, Concept of Parse tree, concept of grammar, Dependency grammar, definition CFG		08 Lectures
Unit-5:	**NLP-Semantic Analysis**		
	Elements of semantic Analysis, difference between polysemy and Homonymy, meaning representation, Approaches to meaning representations, lexical symantics		08 Lectures needed
Prescribed Book			
1.	Ralf Harbrich, Thore greapel, “Handbook of Natural Language Processing” 2nd Ed. CRC,Press, Chapman & Hall book		
Reference Books			
1.	G.U. Rao, “Natural Language Modeling”, HCU		
2.	V. Chaitanya and R. Sangal, “Natural Language Processing: Paninian perspective”, PHP, 1997		

Course Code:	CCS-404 F	**Course Name:** Remote Sensing and GIS	**Credits: 4**
Course Objectives:			
• To aware with Remote sensing mechanism &Geographical Information System • To understand the principles of remote sensing • To apply remote sensing tools to capture specific Geographical position			
Course Outcome:			
• Students will be able to use the concepts of GIS and RS • Students will be able to used arcGIS tool and Remote sensing devices to solve the problem			
Unit-1:	**Introduction RS &GIS**		
	Introduction to GIS: Definition, sources of data, types of data Concept of space and time in GIS ,Spatial information theory, History of GIS ,Objectives of GIS, Elements of GIS ,Hardware and software requirements of GIS ,Application of GIS. Introduction to RS : Introduction to Geographic Information System , Fundamentals of Cartography and Statistical methods ,Practical in Remote Sensing , Practical in GIS ,Practical in Cartography and Map Interpretation		08 Lectures
Unit-2:	**Principles of Remote sensing and interaction**		
	Definition, historical perspective, development of RS in India. EMR and EMR spectrum, EMR quantities. Theories of EMR, Concept of black body, Laws of radiation. Hemispheric reflectance, transmittance, absorptance. Interaction of EMR with the earth surface: reflection, transmission, Spectral Signatures with the atmosphere: scattering, absorption, refraction Atmospheric windows and types of RS.		10 Lectures
Unit-3:	**Image acquisition using Remote sensing**		
	Fundamentals of Arial photography, Scale, resolution, projection, flight planning, overlaps ,Geometric characteristics of aerial photographs ,Measurement of scale and height on aerial photographs.		08 Lectures
Unit-4:	**Advances in Geographic Information System**		
	Digital elevation model ,Need of DEM , Various structures of DEM: line, TIN, grid ,Products derived from DEM		08 Lectures
Unit-5:	**Sensors**		
	Modes of multi-spectral scanning: Across-track and Along-track MSS and TM scanners in Landsat series, HRV scanners in SPOT series LISS, PAN and WiFS scanners in IRS series		08 Lectures needed
Prescribed Book			
1.	Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications		
Reference Books			
1.	Remote Sensing and its applications by LRA Narayana University Press 1999.		
2.	Principals of Geo physical Information Systems " Peter A Burragh and Rachael ,A. Mc Donnell, Oxford Publishers 2004		
3.	Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications		
4.	Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001, B.S.Publications		
5.	GIS by Kang tsung chang, TMH Publications & Co.		
6.	Fundamental of GIS by Mechanical designs John Wiley & Sons		

Course Code:	CCS-404 G	**Course Name:** Software Project Management	**Credits: 4**
Course Objectives:			
• To aware Software development process and obstacles in development • To manage the software project at different phases like technical, budget and schedule • To understand the software contract			
Course Outcome:			
• Students will be able to develop and manage every aspect of software project • Students will be able to deal with the software project contract			
Unit-1:	**Introduction**		
	Software project, Software Projects Vs Other projects, Problems with software projects, Management control, stakeholders, requirement specification, Stepwise project planning.		08 Lectures
Unit -2	**Software Project paradigms and Risk management**		
	Linear Sequential model, Prototyping, Incremental model, RAD. Risks: Types of risk, Risk assessment, Risk Mitigation and Management		
Unit-3:	**Project Evaluation and estimation**		
	Strategic assessment, Technical assessment, cost –benefit analysis, cash flow forecasting, cost- benefit evaluation technique, Risk evaluation, Software effort estimation technique, COCOMO model,		10 Lectures
Unit-4:	**Project Management**		
	Managing contract: Types of contract, stages in contract placement, Typical terms in contract placement, contract management. Managing people: understanding behaviour, motivation, working in groups, leadership, organizational structure,		08 Lectures
Unit-5:	**Monitoring and Control**		
	Selecting the appropriate approach to develop the project, Creating the framework, collecting the data , visualizing progress, Cost monitoring , earned value, Prioritizing Monitoring, change control. Scheduling the task of the project and sequence of schedule, cost of schedule.		08 Lectures
Prescribed Book			
1.	Bob Hughes and mike cotterell, “Software Project Managemet” , 2nd Ed. TMH		
Reference Books			
1.	Robert k. Wysocki , “Effective software project Management”, wiley Publication		
2.	Roger Pressman,, “Software Engineering” a practioner’s approach, 5th ed		

Course Code:	CCS-404 H	**Course Name:** Big Data Analytics	**Credits: 4**
Course 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.			
Course 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-1:	**Data Mining**		
	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.		08 Lectures
Unit-2:	**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.		10 Lectures
Unit-3:	**Classification**		
	Introduction, Classification by Statistical based algorithms, Decision Tree based algorithms, Neural Network based algorithms, Rule based algorithms, Bayesian Classification, Support Vector Machines (SVM).		08 Lectures
Unit-4:	**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, 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.		08 Lectures
Unit-5:	**Web Mining**		
	Introduction: Web Mining- Content Mining, Web Structure Mining, Web Usage Mining, Examples of web mining and applications.		08 Lectures needed
Prescribed Book			
1.	Arun K Pujari, Data Mining Techniques, 2nd edition, Universities Press.		
2.	Sam Aanhory & Dennis Murray, Data Warehousing in the Real World, Pearson Edn Asia		
Reference Books			
1.	Han, Kamber, Morgan Kaufmann, "Data Mining Concepts and Techniques"		
2.	K.P.Soman, S.Diwakar, V. Ajay,Insight into Data Mining, PHI, 2008		
3.	M.H. Dunham, "Data Mining Introductory and Advanced Topics", Pearson Education		
4.	M Berry and G. Linoff, "Mastering Data Mining", John Wiley		
5.	Pieter Adriaans, Dolf Zantinge , "Data Mining", Pearson Education Asia		

Course Code:	CCS-405	Course Name: Lab-10: Mobile Application Development and Web Technology Tools	Credits: 2
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments: As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCS-406	Course Name: Lab-11: based on elective	Credits: 2
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments: As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCS-407	Course Name: Lab-12: Major Project development activity	Credits: 2
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			

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.

Course Code:	CCS-408 A	Course Name: Open Elective	Credits: 2
Open Elective: University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School			

OR

Course Code:	CCS-408 B	Course Name: Introduction to Social Media Technologies	Credits: 2
Course 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.			
Course Outcome:			
• Students are able to create their account on social media • Students are able to use social media effectively			
Unit-1:	**Social Networking Basics**		
	Introduction to social networking sites: Facebook, twitter, Linkedin, youtube etc, creating login to social networking sites, setting properties		04 Lectures

	of an account, communication using social networking sites, advantages and disadvantages of social networking sites.	
Unit-2:	**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.	4 Lectures
Unit-3:	**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.	04 Lectures
Unit-4:	**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	04 Lectures
Unit-5:	**Organizational blogs and Diaries**	
	Definition of blog, attract blog traffic, weblog, effective communication through weblogs, online diary.	04 Lectures needed
Prescribed Book		
1.	Stevenson, Social Media Communcations Technology" published by Stevenson Inc.	
Reference Books		
1.	Kevin lee, "Actionable Social Media Strategy" ebook available on https://buffer.com/resources/social-media-strategies	
2.	Charles Kadushin, Understanding Social Networks: Theories, Concepts, and Findings,Oxford University Press, 2012	
3.	Maksim Tsvetovat, Alexander Kouznetsov, Social Network Analysis for Startups, O'Reilly, 2014	

Course Code:	**CCS-409**	**Course Name:** Skill based activity SK-04	**Credits: 1**
Soft Skills			