Course Title: French Language	***Course Code: HU810F***
Credits (L: T: P): 2:0:0	***Contact Hours (L: T: P): 26:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 25	***SEE Marks: 50***

Pre-requisite: Nil

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand on a basic level how the foreign language functions.
CO-2	Make short statements and grasp beginning-level vocabulary.
CO-3	Write sentences and short paragraphs on familiar topics.

Unit No	Lesson Details	No. of hours
1	Introduction & French Culture.	3
2	Les règles de la langue.	3
3	L'alphabet et les accents français.	2
4	Les Salutations et les conversations formelles et informelles.	2
5	Les Articles français.	2
6	Le Vocabulaire et les nombres.	2
7	L'heure.	2
8	Les Adjectifs Possessifs et Démonstratifs.	2
9	Les Verbes Auxiliaires.	2
10	Les Verbes Réguliers (« ER » Verbes).	2
11	Les Verbes Irréguliers (Vouloir, Pouvoir, Faire et Venir).	2
12	Basic Conversation Practice with vocabulary and verbs learnt.	2

Text Book:

SL.No	Title
1	Course material created by Faculty in charge.

Reference Book:

Sl.No.	Author/s	Title	Publisher Details
1	Delphine Ripaud (Author), Collectif (Author), Didier (Editor)	Saison 1	--

Course Title: German Language	***Course Code: HU810G***
Credits (L: T:P): 2:0:0	***Contact Hours (L: T: P): 26:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 25	***SEE Marks: 50***

Pre-requisite: NIL

Course Outcomes: After completing this course, students should be able to:

CO-1	Identify & analyze.
CO-2	Logical and Contextual Application
CO-3	Task completion.

Unit No	Lesson Details	No. of hours
1	German Language, Alphabets and pronunciation.	3
2	Name & Land.	3
3	Familie and Geschwister.	2
4	Menschen and Einkaufen.	2
5	Zahlen.	2
6	Fahren und Reisen.	2
7	Essen und Trinken.	2
8	Freizeitaktivitäten und Zeit.	2
9	Feste und Jahrezeiten	2
10	Assessment pattern with exercises	2
11	Role plays on social situations	2
12	Extended practice on W-Questions, Verb Questions and Modal Verb questions.	2

Text Book:

SL. No	Author/s	Title
1	Klett	Netzwerk A1

Reference Book:

Sl. No.	Author/s	Title	Publisher Details
1	Studio d	Cornelsens	--

Course Title: Japanese Language	***Course Code: HU810J***
Credits (L: T:P): 2:0:0	***Contact Hours (L: T: P): 26:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 25	***SEE Marks: 50***

Pre-requisite: **NIL**

Course Outcomes: After completing this course, students should be able to:

CO-1	Japanese 1 (Elementary Japanese I) Upon completion of this course, successful students will: 1. Converse in Standard Japanese to perform basic communicative tasks (e.g., exchange greetings/personal information, give time/directions/daily activities) using present/future and past tenses in formal (desu/masu) speech style. Students will do so within the limits of vocabulary and structures appropriate to the beginning Japanese 1 level. (Assessed by: Oral component of final exam)
CO-2	Read and write hiragana, katakana, and approx. 40 basic kanji characters and demonstrate comprehension of prepared (8-10 sentence) texts written in them. (Assessed by: Reading comprehension and/or written component of final exam).
CO-3	Compose simple sentences and responses to questions employing hiragana, katakana, and learned kanji appropriately. (Assessed by: Writing section of final exam).

Unit No	Lesson Details	No. of hours
1	GREETINGS, NUMBERS	3
2	SHOPPING, FAMILY	3
3	TIME	2
4	HIRAGANA,	2
5	PLEASE, NEW VERBS- COME, GO, RETURN in PRESENT TENSE	2
6	CAN WE GO? REQUEST.	2
7	PAST TENSE, KATAKANA	2
8	ADJECTIVES.KANJI	2
9	PRESENT CONTINUOUS, KATAKANA, KANJI	2
10	COUNTING	2
11	PAST CONTINUOUS, KANJI	2
12	FAMILY	2

Text Books:

SL. No	Title
1	MINNA NO NIHONGO ELEMENTARY 1-1

Course Title: Data Warehouse & Data Mining	***Course Code: CS811***
Credits (L: T: P): 3:0:0	***Lecture Hours (L: T: P): 39:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 50	***SEE Marks: 100***

Pre-requisite: Database Management Systems.

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand the various architectures and main components of a data warehouse.
CO-2	Comprehend the data mining tasks, the KDD process, domain information, the issues and challenges.
CO-3	Apply pre-processing statistical methods and process raw data to make it suitable for a range of data mining algorithms
CO-4	Discover and measure interesting patterns from large business datasets.
CO-5	Apply various clustering and classification algorithms to real world data

Unit No.	Course Content	No. of Hours
1.	**Introduction to Data Warehousing:** Data Warehouse: Basic Concepts, Data warehouse Modeling: Data cube and OLAP: Data Cube, Stars, Snowflakes, and Fact Constellations, Typical OLAP Operations, Data Warehouse Design and Usage.	08
2.	**Introduction to Data Mining:** Importance of Data Mining, Kinds of data that can be Mined, What Kinds of patterns can be Mined, Which Technologies are used, which types of Applications are Targeted, Major issues in Data Mining. Data Objects and Attribute Types, Measuring Data Similarity and Dissimilarity.	08
3.	**Data Understanding and Preparation:** An Overview, Major Tasks in Data Preprocessing**,** Data Cleaning: Missing Values, Noisy Data, Data Integration: Entity Identification Problem, Tuple Duplication, Data Value Conflict Detection and Resolution**,** Overview of Data Reduction Strategies, Attribute Subset Selection, Histograms, Clustering, Sampling, Data Transformation Strategies Overview, Data Transformation by Normalization.	08
4.	**Association Rules:** Mining Frequent Patterns, Associations, and Correlations: Market Basket Analysis, Apriori Algorithm: Finding Frequent Itemsets by Confined Candidate Generation, A Pattern- Growth Approach for Mining Frequent Itemsets.	07

5.	**Classification and Cluster Analysis:** Basic Concepts, General Approach to Classification, Decision Tree Induction: Attribute Selection Measures, Tree Pruning, Bayes Classification Methods: Bayes' Theorem, Nai've Bayesian Classification, Overview of Basic Clustering Methods, Partitional Methods: *k*-Means: A Centroid-Based Technique, Hierarchical Methods: Agglomerative versus Divisive Hierarchical Clustering	08

Text Book:

Sl. No.	Author/s	Title	Publisher Details
1	Jiawei Han and Micheline Kamber	Data Mining - Concepts and Techniques	3rd Edition, Morgan Kaufmann Publisher, 2017

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Alex Berson and Stephen J. Smith	Data Warehousing, Data Mining & OLAP	TataMcGraw – Hill Edition, Tenth Reprint 2017
2	Pang Ning Tan, Michael Steinbach and Vipin kumar	Introduction to Data Mining	Pearson, 2016
3	G. K. Gupta	Introduction to Data Mining with Case Studies	3rd Edition, PHI, New Delhi, 2016
4	K.P. Soman, Shyam Diwakar and V. Ajay	Insight into Data Mining Theory and Practice	Eastern Economy Edition, Prentice Hall of India, 2017

Web Resources:

Sl. No.	Web link
1	http://nptel.ac.in/courses/106106093/35
2	https://www.digimat.in/nptel/courses/video/106105174

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	PSO4
CO-1	3	3	0	2	3	0	2	0	2	0	2	2	2	1	2	2
CO-2	3	3	3	2	3	0	2	0	3	0	3	3	3	1	3	3
CO-3	3	3	1	3	3	1	2	1	3	1	3	3	3	1	3	3
CO-4	3	3	1	3	1	1	0	1	2	1	2	2	2	1	2	2
CO-5	3	3	1	2	1	1	0	1	2	1	2	2	2	1	2	2

0 -- No association 1---Low association, 2--- Moderate association, 3---High association

Course title: Deep Learning Architecture	***Course Code:CS812***
Credits (L: T: P): 3:0:0	***Contact Hours (L: T: P): 39:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks :50	***SEE Marks: 100***

Pre-requisite: Machine Learning.

Course Outcomes: After completing this course, students should be able to:

CO-1	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
CO-2	Implement deep learning algorithms and solve real-world problems.
CO-3	Execute performance metrics of Deep Learning Techniques.

Unit No.	Course Content	No. of Hours
1.	**Introduction to ANN:** Biological to Artificial neuron, Training an MLP, training a DNN with TensorFlow, Fine tuning NN Hyper Parameters Up and Running with TensorFlow	07
2.	**Deep Neural network:** Introduction, Vanishing Gradient problems, Reusing Pretrained layers, Faster optimizers, avoiding over fitting through regularization	08
3	**Distributing Tensor flow across devices and servers:** Multiple devices on a single machine, multiple servers, parallelizing NN on a Tensor Flow cluster Convolution Neural Network: Architecture of the visual cortex, Convolutional layer, Pooling layer, CNN architecture	08
4.	**Recurrent Neural Network:** Recurrent neurons, Basic RNN in Tensor Flow, Training RNN, Deep RNNs, LSTM Cell, GRU Cell, NLP	08
5.	**Autoencoders:** Efficient data representation, Performing PCA, stacked autoencoders, Unsupervised pretraining using SA, Denoising, Sparse autoencoders, variational and other autoencoders. Reinforcement Learning: Learning to optimize rewards, policy search, Introduction to OpenAI Gym, Neural network polices, Evaluating actions, Policy gradients, Markov decision processes, TDL and Q-learning, Learning to play Ms.Pac-man using Deep Q Learning	08

Text Book:

Sl. No.	Author/s	Title	Publisher Details
1	Aurelien Geron	Hands on Machine Learning with Scikit-Learn &TensorFlow	O'Reilly, 2019

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Lan Good fellow and Yoshua Bengio and Aaron Courville	Deep Learning	MIT Press2016
2	Charu C. Aggarwal	Neural Networks and Deep Learning	Springer International Publishing, 2018
3	Andrew W. Trask	Grokking Deep Learning	Manning Publications
4	Sudharsan Ravichandran	Hands-On Deep Learning Algorithms with Python	--

Web Resources:

Sl. No.	Web link
1	https://onlinecourses.nptel.ac.in/noc20_cs62/preview
2	https://nptel.ac.in/courses/106/105/106105215/

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	PSO4
CO-1	1	2	3	1	3	3	1	3	3	3	3	3	2	3	3	3
CO-2	3	3	3	3	3	2	2	2	1	2	3	2	1	2	3	2
CO-3	3	1	2	3	1	2	2	2	3	3	3	2	3	2	3	3

0 -- No association 1---Low association, 2--- Moderate association, 3---High association

Course Title: Network Management	***Course Code: CS813***
Credits (L: T: P): 3:0:0	***Contact Hours (L: T:P): 39:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 50	***SEE Marks: 100***

Pre-requisite: Computer Networks.

Course Outcomes: After completing this course, students should be able to:

CO-1	Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
CO-2	Apply network management standards to manage practical networks.
CO-3	Formulate possible approaches for managing OSI network model.
CO-4	Infer SNMP for managing the network and RMON for monitoring the behavior of the network.
CO-5	Identify the various components of network and formulate the scheme for the managing them.

Unit No.	Course Content	No. of Hours
1	**Introduction:** Analogy of Telephone Network Management, Data and Telecommunication Network Distributed computing Environments, TCP/IP Based Networks: The Internet and Intranets, Communications Protocols and Standards- Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management – The Importance of topology , Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management.	08
2	**Basic Foundations:** Standards, Models, and Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model.	07
3	**SNMPv1 Network Management:** Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, and System Overview. The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base. The SNMP Communication Model – The SNMP Architecture,	08

	Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group, Functional Model SNMP Management – RMON: Remote Monitoring, RMON SMI and MIB, RMONI1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications.	
4	**Broadband Access Networks:** Broadband Access Networks, Broadband Access Technology; HFCT Technology: The Broadband LAN, The Cable Modem, The Cable Modem Termination System, The HFC Plant, The RF Spectrum for Cable Modem; Data Over Cable, Reference Architecture; HFC Management – Cable Modem and CMTS Management, HFC Link Management, RF Spectrum Management, DSL Technology; Asymmetric Digital Subscriber Line Technology – Role of the ADSL Access Network in an Overall Network, ADSL Architecture, ADSL Channeling Schemes, ADSL Encoding Schemes; ADSL Management – ADSL Network Management Elements, ADSL Configuration Management, ADSL Fault Management, ADSL Performance Management, SNMP-Based ADSL Line MIB, MIB Integration with Interfaces Groups in MIB-2, ADSL Configuration Profiles	08
5	**Network Management Applications:** Configuration Management- Network Provisioning, Inventory Management, Network Topology, Fault Management- Fault Detection, Fault Location and Isolation 24 Techniques, Performance Management – Performance Metrics, Data Monitoring, Problem Isolation, Performance Statistics; Event Correlation Techniques – Rule-Based Reasoning, Model-Based Reasoning, Case Based Reasoning, Codebook correlation Model, State Transition Graph Model, Finite State Machine Model, Security Management – Policies and Procedures, Security Breaches and the Resources Needed to Prevent Them, Firewalls, Cryptography, Authentication and Authorization, Client/Server Authentication Systems, Messages Transfer Security, Protection of Networks from Virus Attacks, Accounting Management, Report Management, Policy- Based Management, Service Level Management.	08

Text Book:

Sl. No.	Author/s	Title	Publisher Details
1	Mani Subramanian	Network Management- Principles and Practice	2nd Pearson Education, 2010.

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	J. Richard Burke	Network Management Concepts and Practices: A Hands-On Approach	PHI, 2008.

2	Morris	Network management	1st Edition, Pearson Education, 2008.
3	Mark Burges	"Principles of Network System Administration"	1st Edition, Wiley DreamTech, 2008.
4	Alexander Clemm	Network Management Fundamentals	Cisco Press (2007), ISBN 1-58720-137-2

Web Resources:

Sl. No.	Web link
1	https://nptel.ac.in/courses/106/105/106105183/
2	https://youtu.be/liBB_Q7Go5k

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	PSO4
CO-1	2	2	2	2	2	1	1	1	1	1	1	1	3	0	2	2
CO-2	3	2	2	3	2	2	1	1	1	1	1	2	3	0	3	3
CO-3	2	3	2	3	3	2	1	1	1	1	1	2	3	0	3	3
CO-4	2	2	1	3	3	2	1	1	1	1	1	2	3	0	3	3
CO-5	3	3	1	3	3	2	1	1	1	1	1	2	3	0	3	3

0 -- No association 1---Low association, 2--- Moderate association, 3---High association

Course Title: Green Computing	***Course Code: CS814***
Credits (L: T: P): 3:0:0	***Contact Hours (L: T: P): 39:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 50	***SEE Marks: 100***

Pre-requisite: NIL

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand the principles and practices of green computing.
CO-2	Interpret business process models by adopting environmental intelligence.
CO-3	Participate in green movement and contribute to society.

Unit No.	Course Content	No. of Hours
1	**Fundamentals:** Green IT Fundamentals: Business, IT and the Environment; Green computing: carbon foot print, scoop on power, Green IT Strategies: Drivers, Dimensions, and Goals, Environmentally Responsible Business: Policies, Practices, and Metrics.	07
2	**Green Assets and Modeling:** Green Assets: Buildings, Data Centers, Networks, and Devices; Green Business Process Management: Modeling, Optimization, and Collaboration; Green Enterprise Architecture; Environmental Intelligence; Green Supply Chains; Green Information Systems: Design and Development Models.	08
3	**Grid Framework:** Virtualizing of IT systems; Role of electric utilities, Telecommuting, teleconferencing and teleporting; Materials recycling; Best ways for Green PC; Green Data center; Green Grid framework.	08
4	**Green Compliance:** Socio-cultural aspects of Green IT; Green Enterprise Transformation Roadmap; Green Compliance: Protocols, Standards, and Audits; Emergent Carbon Issues: Technologies and Future.	08
5	**Case Studies:** The Environmentally Responsible Business Strategies (ERBS); Case Study Scenarios for Trial Runs; Case Studies: Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.	08

Text Book:

Sl. No.	Author/s	Title	Publisher Details
1	Bhuvan Unhelkar	Green IT Strategies and Applications-Using Environmental Intelligence	CRC Press, June 2011

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Woody Leonhard, Katherrine Murray	Green Home computing for dummies	August 2009
2	San Murugesan, G. R. Gangadharan	Harnessing Green IT	WILEY 1st Edition-2013
3	Yelne Vaibhav	Green Computing	LAP Lambert Academic Publishing
4	Kashinath Bedare	Green Computing	Eastern Book Promoters Belgaum,2018

Web Resources:

Sl. No.	Web link
1	https://www.youtube.com/watch?v=zz_8F3cenBk.
2	https://www.tomw.net.au/technology/it/green_computing_professional/

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	PSO4
CO-1	2	3	3	3	2	3	3	1	1	2	3	3	2	1	2	2
CO-2	3	3	3	2	2	3	3	1	1	2	3	2	3	1	3	3
CO-3	3	3	3	3	3	3	3	1	1	2	3	2	3	1	3	3
CO-4	3	3	3	3	3	3	3	1	2	0	3	2	2	1	2	2
CO-5	3	3	3	2	3	3	3	1	2	1	2	2	2	1	2	2

0 -- No association 1---Low association, 2--- Moderate association, 3---High association

Course title: Mobile Application Development	***Course Code: CS815***
Credits (L: T:P): 3:0:0	***Contact Hours (L: T: P): 39:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 50	***SEE Marks: 100***

Pre-requisite: Oriented Programming Language, DBMS.

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand the discipline of Mobile Application Development using J2ME Technology.
CO-2	Develop small computing Application with J2ME Architecture.
CO-3	Implement User Interface for a J2ME application.
CO-4	Understand the usage of Record Storage and JDBC Drivers.
CO-5	Design protocols for J2ME Application with DBMS using Embedded SQL.

Unit No.	Course Content	Hours
1.	**J2ME Overview:** Java 2 Micro Edition and the World of Java, Inside J2ME, J2ME and Wireless Devices. Small Computing Technology: Wireless Technology, Radio Data Networks, Microwave Technology, Mobile Radio Networks, Messaging, Personal Digital Assistants.	08
2.	**J2ME Architecture and Development Environment:** J2ME Architecture, Small Computing Device Requirements, Run Time Environment, MIDlet Programming, Java Language for J2ME, J2ME Software Development Kits, Hello World J2ME Style, Multiple MIDlets in a MIDlet Suite, J2ME Wireless Toolkit.	08
3	**J2ME Best Practices and Patterns:** The Reality of Working in a J2ME World, Best Practices Commands, Items, and Event Processing. J2ME User Interfaces: Display Class, C Command Class, Item Class, Exception Handling.	08
4.	**Record Management System:** Record Storage, Writing and Reading Records, Record Enumeration, Sorting Records, Searching Records, Record Listener. JDBC Objects: The Concept of JDBC, JDBC Driver Types, JDBC Packages, Overview of the JDBC Process, Database Connection, statement Objects, Result set, Transaction Processing, Metadata, Data Types, Exception.	08
5.	**JDBC and Embedded SQL**: Model Programs, Tables, Indexing, Inserting Data into Tables, Selecting Data from a Table, Updating Tables, Deleting Data form a Table, Joining Tables,	07

Text Book:

Sl. No.	Author/s	Title	Publisher Details
1	James Keogh	J2ME the Complete Reference	Tata Mc Graw Hill, 1st Edition, 2004

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Michael Juntao Yuan	Enterprise J2ME, Developing Mobile Java Applications,	Pearson Education, 2004.
2	Ray Rischpater	Beginning Java ME Platform	Apress, 2009
3	Sing Li, Jonathan B. Knudsen	Beginning J2ME: From Novice to Professional,	Third Edition,Apress, 2005
4	Anubhav Pradhan, Anil V Deshpande,	Composing Mobile Apps using Android	Wiley 2014

Web Resources:

Sl. No.	Web link
1	https://nptel.ac.in/content/storage2/courses/106106156
2	https://onlinecourses.swayam2.ac.in/nou21_ge41/preview

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	PSO4
CO-1	3	2	2	2	2	1	1	1	1	2	2	2	3	2	1	1
CO-2	3	2	2	2	2	1	1	1	1	2	2	2	3	2	1	1
CO-3	3	2	2	2	2	1	1	1	1	2	2	2	3	2	1	1
CO-4	3	2	2	2	2	1	1	1	1	2	2	2	3	2	1	1
CO-5	3	2	2	2	2	1	1	1	1	2	2	2	3	2	1	1

0 -- No association 1---Low association, 2--- Moderate association, 3---High association

Course Title: Enterprise Resource Planning	***Course Code: CS821***
Credits (L: T: P): 3:0:0	***Contact Hours (L: T: P): 39:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 50	***SEE Marks: 100***

Pre-requisite: NIL

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand the basic use of Enterprise software, and its role in integrating business functions.
CO-2	Design the ERP implementation strategies.
CO-3	Create reengineered business processes for successful ERP implementation.
CO-4	Apprehend some popular products in the area of ERP.
CO-5	Analyze the current and future trends in ERP

Unit No.	Course Content	No. of Hours
1	**Introduction and Related Technologies**: Enterprise – An Overview, Introduction to ERP, Benefits of ERP.ERP and Related Technologies, Business Process Reengineering (BPR), Data Warehousing and Data Mining, online analytical processing (OLAP), Product Life Cycle Management, Supply Chain Management (SCM), Customer relationship management (CRM).	08
2	ERP Implementation: Implementation challenges, ERP Implementation Strategies, ERP Implementation Lifecycle, Implementation Methodologies, ERP Deployment Methods, Vendors and Consultants, Contracts with Vendors, Consultants and Employees, Project Management and Monitoring.	08
3	The Business Modules: Business modules in an ERP Package, Financials, Manufacturing, Human Resources Management, Plant Maintenance, Materials Management, Quality Management, Sales, Distribution and Service.	08
4	The ERP Market: ERP Market Place and Marketplace Dynamics, ERP Vendors, SAP AG, Oracle Corporation, Microsoft Dynamics, Infor, Epicor, Sage Group PLC, Plex Systems, QAD, 31 Infotech, Ramco systems.	08
5	ERP – Present and Future: Turbo Charge the ERP System, Enterprise Application Integration (EAI), ERP and E-Business, ERP, Internet and WWW, Future Directions and Trends in ERP.	07

Text Book:

Sl. No.	Author/s	Title	Publisher Details
1	Alexis Leon	ERP Demystified	Third Edition, Tata McGraw Hill, 2012.

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Joseph A Brady, Ellen F Monk, Bret Wagner,	Concepts in Enterprise Resource Planning	Thompson Course Technology, USA, 2001.
2	Vinod Kumar Garg	Enterprise Resource Planning Concepts and Practice	Second Edition of PHI Edition 2008.
3	Steven Scott Phillips	Control Your ERP Destiny: Reduce Project Costs, Mitigate Risks, and Design Better Business Solutions	Steven Phillips, First Edition.
4	Marianne Bradford	Modern ERP: Select, Implement, and Use Today's Advanced Business Systems	Amazon Digital Services LLC - KDP Print US, 2020.

Web Resources:

Sl. No.	Web link
1	http://nptel.ac.in/courses/110105083/1 and series of lectures
2	https://www.youtube.com/watch?v=E0tgKVOxihI and other related videos

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	PSO4
CO-1	2	3	3	3	2	2	2	1	1	2	3	3	2	1	2	2
CO-2	2	3	3	2	2	2	2	1	1	2	3	2	3	1	3	2
CO-3	2	3	2	3	3	2	2	1	1	2	3	2	3	1	3	2
CO-4	2	3	2	3	3	2	1	1	2	1	3	2	2	1	2	2
CO-5	2	3	3	2	3	2	1	1	2	1	2	2	2	1	2	2

0 -- No association 1---Low association, 2--- Moderate association, 3---High association

Course Title: Software Modeling	***Course Code: CS822***
Credits (L: T: P): 3:0:0	***Contact Hours (L: T: P): 39:0:0***
Type of Course: Lecture	***Category: Professional elective Course***
CIE Marks: 50	***SEE Marks: 100***

Pre-requisite: Software Engineering.

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand the concept of OO Methodologies and use of UML notations.
CO-2	To familiarize with the concepts of Object-oriented analysis process.
CO-3	Analyze and implement various operations on Linear and Non-linear data structures.
CO-4	Understanding the design of different layers in Object oriented Software.
CO-5	Comprehend various object-oriented design principles and Patterns.

Unit No.	Course Content	No. of Hours
1	**Object Oriented Methodologies, UML:** Views of Software Developments: Traditional System Development Methodology and Object-Oriented Analysis and Design, Importance Object - Orientation. Unified Modeling Language: Introduction to Modeling and UML, MDA, UML Structure, UML Building Blocks, UML Common Mechanisms, Introduction to all UML Diagram Notational Techniques, 4 + 1 View.	7
2	**Object Oriented Analysis:** Object Oriented Analysis Process, Use Case Modeling: Actor Identification, Actor Classification, Actor Generalization, Use Cases Identification, Communication, Uses/Include and Extend Associations, writing a Formal Use Cases, Use Case realizations. Domain / Class Modeling: Approaches for Identifying Classes (Noun - Phase Approach, Common Class Pattern Approach, Class Responsibilities Collaboration Approach, Naming Classes, Class Associations and Identification of Associations, Generalization/Specialization Relationship, Aggregation and Composition Relationships, Attributes and Methods Identification.	8
3	**Interaction and Behavior Modeling:** Activity Diagram: Activity and Actions, Initial and Final Activity, Activity Edge, Decision and Merge Points, Fork and Join, Input and Output Pins, Activity Group, Activity Partitions. Sequence Diagram: Context, Objects and Roles, Links, Object Life Line, Message or stimulus, Activation/Focus of Control, Modeling Interactions. Collaboration Diagram: Objects and Links, Messages and stimuli, Active Objects, Communication Diagram, Iteration Expression, Parallel Execution, Guard Expression, Timing Diagram. State Diagram: State Machine, Triggers and Ports, Transitions, Initial and Final State, Composite States, Submachine States.	8

4	**Object Oriented Design:** Object Oriented design process, design Business Layer: Object Oriented Constraints Language (OCL), Designing Business Classes: The Process, Designing Well Defined Class Visibility, Attribute Refinement, Method Design Using UML Activity Diagram, Packaging and Managing Classes. Designing Access Layer: Object Relational Systems, Object Relation Mapping, Table Class Mapping, Table - Inherited Classes Mapping, Designing the Access Layer Classes: The Process, Design View Layer: View Layer Classes Design, Identifying View Classes by Analyzing Use Cases, Macro-Level Design Process, and Prototyping the User Interface. Component and Deployment Design using Component and Deployment Diagram.	9
5	**Design Principles and Patterns:** Introduction to Patterns, General Responsibility Assignment Software Patterns (GRASP): Introduction, Creator, Information Expert, Low coupling, Controller, High Cohesion, Polymorphism, Pure fabrication, Indirection, Protected Variations. Gang of Four (GoF): Introduction, Categories of Patterns (Creational, Structural and Behavioral Patterns), Singleton, Adapter, State, and Strategy.	7

Text Book:

Sl. No.	Author/s	Title	Publisher Details
1	A. Puntambekar , Deepali D. Londhe, Technical Publications	Software Design and Modeling	3rd edition, Amazon Asia-Pacific Holdings Private Limited, Kindle Edition, JUNE-2020.

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Michael Blaha and James Rumbauh,	Object - Oriented Modeling and Design	January 2011.
2	Grady Booch	Object-Oriented Analysis and Design with Applications	Addison-Wesley, 20073rd edition,2007.
3	Carol Britton and Jill DoakeElsevier	A Student Guide to Object-Oriented Development	2005, First Edition.
4	Hassan GomaaGeorge	Software modeling and design	Cambridge University Press

Web Resources:

Sl. No.	Web link
1	https://nptel.ac.in/courses/106/101/106101061/
2	https://nptel.ac.in/courses/106/105/106105153/

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	PSO4
CO-1	3	2	1	3	3	3	2	2	3	3	3	2	2	3	2	2
CO-2	3	3	3	3	2	2	2	1	2	1	3	2	2	2	2	2
CO-3	2	3	3	3	3	2	2	2	2	2	2	2	3	3	3	2
CO-4	3	3	2	3	3	2	2	2	3	2	3	2	2	2	3	3
CO-5	2	3	3	3	3	3	2	2	2	2	3	2	2	3	2	3

0 -- No association 1---Low association, 2--- Moderate association, 3---High association

Course Title: Multimedia Computing	***Course Code: CS823***
Credits (L: T: P): 3:0:0	***Contact Hours (L: T: P): 39:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 50	***SEE Marks: 100***

Pre-requisite: NIL.

Course Outcomes: After completing this course, students should be able to:

CO-1	Understanding the ability to apply appropriate underpinning theory and conceptual approaches for multimedia practitioners from a range of disciplines.
CO-2	Comprehend the knowledge and remembering the range of evaluation techniques and their deployment in a multimedia context.
CO-3	Explore, discuss and evaluate key components of legal, ethical, and cultural issues relevant to a multimedia practitioner.

Unit No.	Course Content	No. of Hours
1	**Introduction, Media and Data Streams, Audio Technology:** Multimedia Elements; Multimedia Applications; Multimedia Systems Architecture; Evolving Technologies for Multimedia Systems; Defining Objects for Multimedia Systems; Multimedia Data Interface Standards; The need for Data Compression; Multimedia Databases. Media: Perception Media, Representation Media, Presentation Media, Storage Media, Transmission Media, Information Exchange Media, Presentation Spaces & Values, and Presentation Dimensions; Key Properties of a Multimedia System: Discrete & Continuous Media, Independence Media, Computer Controlled Systems, Integration;	08
2	**Graphics and Images, Video Technology, Computer-Based Animation:** Capturing Graphics and Images Computer Assisted Graphics and Image Processing; Reconstructing Images; Graphics and Image Output Options. Basics; Television Systems; Digitalization of Video Signals; Digital Television; Basic Concepts; Specification of Animations; Methods of Controlling Animation; Display of Animation; Transmission of Animation; Virtual Reality Modeling Language.	08
3	**Data Compression - 1:** Storage Space; Coding Requirements; Source, Entropy, and Hybrid Coding; Basic Compression Techniques; JPEG: Image Preparation, Lossy Sequential DCT-based Mode, Expanded Lossy DCT based Mode, Lossless Mode, Hierarchical Mode	07

4	**Optical Storage Media:** History of Optical Storage; Basic Technology; Video Discs and Other WORMs; Compact Disc Digital Audio; Compact Disc Read Only Memory; CD-ROM Extended Architecture; Further CD-ROM Based Developments; Compact Disc Recordable; Compact Disc Magneto Optical; Compact Disc Read/Write; Digital Versatile Disc.	08
5	**Multimedia Application Design:** Multimedia Application Classes; Types of Multimedia Systems; Virtual Reality Design; Components of Multimedia Systems; Organizing Multimedia Databases; Application Workflow Design Issues; Distributed Application Design Issues.	08

Text Book:

Sl. No	Author/s	Title	Publisher Details
1	Ralf Steinmetz, Klara Narstedt	Multimedia Fundamentals	Vol 1- Media Coding and Content Processing, 2nd Edition, PHI, Indian Reprint 2008

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Prabhat K. Andleigh, Kiran Thakrar	Multimedia Systems Design	PHI, 2003.
2	K.R Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic	Multimedia Communication Systems: Techniques, Standards, and Networks	Pearson Education, 2002
3	Nalin K Sharad	Multimedia Information Networking	PHI, 2002.
4	Fred Halsall	Multimedia Communications	Pearson education, 2001

Web Resources:

Sl. No.	Web link
1	https://www.coursera.org/lecture/internet-of-things-multimedia/multimedia-computing-and-classification-KRa30.
2	https://www.educations.com/study-abroad/algebra-university-college/bachelor-in-multimedia-computing-801105.

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	PSO4
CO-1	2	1	2	0	3	1	0	0	2	1	2	3	2	3	2	2
CO-2	2	1	3	0	3	1	2	0	2	2	2	3	2	3	2	2
CO-3	2	1	2	0	3	2	0	0	2	2	2	3	3	3	2	2

0 -- No association 1---Low association, 2--- Moderate association, 3---High association

Course Title: Cyber Security	***Course Code: CS824***
Credits (L: T:P): 3:0:0	***Contact Hours (L: T: P): 39:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 50	***SEE Marks: 100***

Pre-requisite: Computer Networks.

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand Cryptography and its need to various applications.
CO-2	Design and develop simple cryptography algorithms.
CO-3	Illustrate Key Management issues and solutions.
CO-4	Analyze and authenticate the very essential algorithms.
CO-5	Interpret the intrusions and prevention in the system.

Unit No.	Course Content	No. of Hours
1	**Introductio**n: Cyber Attacks, Defense Strategies and Techniques, Guiding Principles, Mathematical Background for Cryptography – Modulo Arithmetic's, The Greatest Comma Divisor, Useful Algebraic Structures, Chinese Remainder Theorem, Basics of Cryptography - Preliminaries, Elementary Substitution Ciphers, Elementary Transport Ciphers, Other Cipher Properties, Secret Key Cryptography – Product Ciphers, DES Construction.	08
2	**Public Key Cryptography and RS**A: RSA Operations, Why Does RSA Work? Performance, Applications, Practical Issues, Public Key Cryptography Standard (PKCS), Cryptographic Hash - Introduction, Properties, Construction, Applications and Performance, The Birthday Attack, Discrete Logarithm and its Applications - Introduction, Diffie-Hellman Key Exchange, Other Applications.	08
3	**Key Managemen**t: Introduction, Digital Certificates, Public Key Infrastructure, Identity–based Encryption, Authentication–I - One way Authentication, Mutual Authentication, Dictionary Attacks, Authentication – II – Centralized Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics, IPSec- Security at the Network Layer – Security at Different layers: Pros and Cons.	08
4	**IEEE 802.11 Wireless LAN Security:** Background, Authentication, Confidentiality and Integrity, cellphone security, GSM(2G) Security, Security in UMTS(3G), Non-Cryptographic Protocol Vulnerabilities –DoS, DDoS, Session Hijacking and Spoofing, Pharming Attacks, Wireless LAN Vulnerabilities, Software Vulnerabilities- Phishing, Buffer overflow, Format String Attacks, Cross-site Scripting.	08

5	**Viruses, Worms, and Other Malware:** Virus and Worm Feature, Internet Scanning Worms, Topological Worms, Mobile Malware, Botnets. Firewalls – Basics, Practical Issues, Intrusion Prevention and Detection - Introduction, Prevention Versus Detection, Types of Instruction Detection Systems, DDoS Attacks Prevention/Detection, Web Service Security.	07

Text Book:

Sl. No	Author/s	Title	Publisher Details
1	Bernard Menezes	Cryptography, Network Security and Cyber Laws	Cengage Learning, 2010 edition.

Reference Books:

Sl. No	Author/s	Title	Publisher Details
1	Behrouz A Forouzan, Debdeep Mukhopadhyay	Cryptography and Network Security	Mc-GrawHill, 3rd Edition, 2015
2	William Stallings	Cryptography and Network Security	Pearson Education, 7th Edition
3	Vivek Sood	Cyber Law simplified	Mc-GrawHill, 11th reprint, 2013
4	Alfred Basta, Nadine Basta, Mary brown, ravindra kumar	Cyber security and Cyber Laws	Cengage learning, 1st Edition, 2018.

Web Resources:

Sl. No.	Web link
1	https://onlinecourses.swayam2.ac.in/cec20_cs15/preview
2	htttps://onlinecourses.swayam2.ac.in/nou19_cs08/preview

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	PSO4
CO-1	3	2	1	0	0	0	0	0	0	0	0	0	1	2	0	0
CO-2	3	2	2	3	0	0	0	0	0	0	0	0	2	2	0	0
CO-3	3	2	2	2	0	0	0	0	0	0	0	0	1	2	0	0
CO-4	3	3	2	2	3	0	0	0	0	0	0	0	2	2	0	0
CO-5	3	3	2	2	2	0	0	0	0	0	0	0	2	2	0	0

0 -- No association 1---Low association, 2--- Moderate association, 3---High association

Course Title: Software Quality Assurance	***Course Code: CS825***
Credits (L: T:P): 3:0:0	***Total Contact Hours (L: T: P): 39:0:0***
Type of Course: Lecture	***Category: Professional Elective Course***
CIE Marks: 50	***SEE Marks: 100***

Pre-requisite: NIL.

Course Outcomes: After completing this course, students should be able to:

CO-1	Understand the basic of software quality, quality factors and be exposed to the Software Quality Assurance (SQA) architecture and the details of SQA components
CO-2	Demonstrate the capability to adopt quality standards.
CO-3	Analyze how the SQA components can be integrated into the project life cycle and assess the quality of software product.
CO-4	Apply the concepts in preparing the quality plan and documents

Unit No.	Course Content	No. of Hours
1	**Introduction:** Software quality and quality assurance definitions, Principles of SQA, Software errors, faults and failures, software quality assurance versus software quality control, The need for comprehensive software quality requirements, McCall's classic model and ISO/IEC 25010 for s/w quality factors, s/w compliance with the quality factors, s/w development, maintenance and SQA environments.	08
2	**SQA Process Implementation Activities**: Establishing SQA process, Coordinating SQA process with related s/w process, the process of preparing SQA plan and project plan, Objectives of cost of s/w quality measurements, classic model of cost of s/w quality, data required for SQA model, The SQA model and its application for comparing V & V plans, Objectives of documentation control processes, The implementation of document control.	08
3	**Product Assurance Activities for Conformance:** The evaluation of project plans for conformance, The evaluation of project's software products for conformance, Formal design reviews, Peer reviews, s/w maintenance maturity model, s/w quality metrics, Implementation of s/w quality metrics, product metrics and their classifications, s/w product size and attribute metrics	08

4	**Process Assurance Activities for Conformance:** The evaluation of life cycle process, required environments and process for conformance, The "3S" development team, the corrective and preventive action plans, benefits and risk of introducing external performers, SQA activities for assuring external performer's process quality, s/w development process metrics, operation metrics, maintenance process metrics, the s/w chance control function in the organization, SQA activities related to SCC	08
5	**Additional Tools and Methods Supporting S/W Quality:** Organizational framework for implementing templates and checklists, s/w configuration items, release and documentation of s/w configuration versions, computerized tools for performing configuration management, CASE tools and their contribution to s/w quality.	07

Text Book:

Sl. No.	Author/s	Title	Publisher Details
1	Daniel Galin	Software Quality Concepts and Practice	Ist edition, Wiley-IEEE Computer Society, 2018.

Reference Books:

Sl. No.	Author/s	Title	Publisher Details
1	Jeff Tian	Software Quality Engineering	Paperback edition,2006, Wiley
2	Allan C. Gillies	Software Quality: Theory and Management	2nd edition, Thomson Learning, 2003
3	Stephen H. Kan	Metrics and Models in Software Quality Engineering	2nd edition, Pearson Education (Singapore) Pte Ltd., 2003
4	Neil Walkinshaw	Software Quality Assurance	Paperback edition, 2010, Springer International Publishing

Web Resources:

Sl. No.	Web link
1	www.inf.ed.ac.uk/teaching/.../notes/LectureNote20_SoftwareQuality.pdf
2	web.uettaxila.edu.pk/CMS/SP2012/.../notes%5CSQA%20Lec_2.pdf

Course Outcomes	Program Outcomes												PSO's			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	P012	PSO1	PSO2	PSO3	PSO4
CO-1	3	3	2	2	3	3	2	1	3	3	3	3	3	1	3	2
CO-2	3	3	2	2	3	3	2	1	3	3	3	3	3	1	3	2
CO-3	3	3	2	2	3	3	2	1	3	3	3	3	3	1	3	2
CO-4	3	3	2	2	3	3	2	1	3	3	3	3	3	1	3	2

0 -- No association 1---Low association, 2--- Moderate association, 3---High association