

UNIVERSITY OF MADRAS
MASTER OF BUSINESS ADMINISTRATION (MBA) DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

934E916: Specialization Courses in Systems Management

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916A	Database Management System	Elective	3	-	-	-	3	3	25	75	100
934E916B	System Analysis and Design	Elective	3	-	-	-	3	3	25	75	100
934E916C	Decision Support System	Elective	3	-	-	-	3	3	25	75	100
934E916D	E – Business	Elective	3	-	-	-	3	3	25	75	100
934E916E	Internet of Things	Elective	3	-	-	-	3	3	25	75	100
934E916F	Cloud Computing	Elective	3	-	-	-	3	3	25	75	100
934E916G	Enterprise Resource Planning	Elective	3	-	-	-	3	3	25	75	100
934E916H	Software project and quality management	Elective	3	-	-	-	3	3	25	75	100
934E916I	Data Warehousing	Elective	3	-	-	-	3	3	25	75	100
934E916J	Deep Learning and Artificial Intelligence	Elective	3	-	-	-	3	3	25	75	100

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916A	Data Base Management System	Elective	3	-	-	-	3	45	25	75	100
Course Objectives											
C1	To provide insights to the database concepts and modeling.										
C2	To throw light on RDBMS and basic structure of SQL.										
C3	To familiarize on integrity & domain constraints and normalization using functional, multivalued, join dependencies.										
C4	To create awareness and importance of object oriented data model.										
C5	To elucidate on database system architectures.										
SYLLABUS											
UNIT	Details							No. of Hours	Course Objectives		
I	Introduction – Data Models – Database languages – Transaction – Storage management – Database administrator – Users – overall system structure – Entity – Relationship Model – Basic concepts –Mapping constraints – keys – E - R Diagram – Weak Entity Sets –reduction of E- R Diagram to tables.							9	C1		
II	Relational Model – structure – relational algebra – extended operations – Modifications on a database – views – SQL – basic structure – set operations – aggregate functions – Nested Sub queries – derived relations, views.							9	C2		
III	Integrity constraints – Domain constraints – referential integrity – assertions – triggers – functional dependencies – relational database design – decomposition – normalization using functional, multivalued, Join dependencies– Domain – Key Normal form – alternative approaches.							9	C3		
IV	Object Oriented data Model – Languages – Object Relational databases: Nested Relations – Complex types and object Orientation – Querying with complex types – creation of complex values and objects – comparison.							9	C4		
V	Database System Architectures : Centralized Systems, Client server systems, Distributed systems, Parallel databases – introduction –inter query –intra							9	C5		

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	query, intra-operation –interoperation parallelism – distributed databases –distributed data storage– network transparency –Query processing – Transaction model–Commit protocols –coordinator selection –concurrency control –deadlock handling – multi database systems.		
	Total	45	
Course Outcomes			
Course Outcomes	On completion of this course, students will;	Program Outcomes	
CO1	Summarise the database concepts and modeling.	P02, P06	
CO2	Recall the concept of RDBMS and basic structure of SQL.	P01, P06	
CO3	Generalise on integrity & domain constraints and normalization using functional, multivalued, join dependencies.	P01, P05, P06	
CO4	Formulate one’s understanding on object oriented data model.	P01, P06	
CO5	Criticise and compare the database system architectures.	P02, P05, P06	
Reading List			
1.	T. William Olle, Database management system, Encyclopedia of Computer Science		
2.	Journal of Intelligent Information Systems - Integrating Artificial Intelligence and Database Technologies, Springer		
3.	Knowledge and Information Systems, Springer		
4.	Journal of Network and Systems Management, Springer		
	TEXT BOOKS		
1.	C.J. Date, A.Kannan, S.SwamiNadhan, An Introduction to Database systems, , Pearson, 8 th Edition, 2003		
2	Paneerselvam, R; Database Management Systems; PHI; 2018		
3	SatinderBal Gupta; Aditya Mittal; Introduction to Database Management; Laxmi Publication; 2009		
4	Raghu Ramakrishnan;JohannesGehrke; Database management systems; third edition; McGraw Hill; 2000		
5	Rajiv Chopra; Database management sytems: A Practical approach; 5 th edition; S Chand and company; 2008		

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References Books		
1.	A Silberschatz, H Korth, S Sudarshan, “Database System and Concepts ”, McGraw-Hill, 6 th Edition, 2013	
2.	Raghurama Krishnan, Johannes Gehrke, Data base Management Systems, McGraw-Hill 3 rd Edition, 2014.	
3.	ElmasriNavathe, Fundamentals of Database Systems, Pearson Education, 7 th Edition, 2015	
4.	Rob, Coronel, “Database Systems”, Seventh Edition, Cengage Learning, 2006.	
	Total	100 Marks

CO – PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1		S				S		
CO 2	M					S		
CO 3	M				S	M		
CO 4	S					M		
CO 5		S			S	M		

S-Strong M-Medium L-Low

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916B	System Analysis and Design	Elective	3	-	-	-	3	45	25	75	100
Course Objectives											
C1	To familiarize the students on the fundamentals of system analysis and design.										
C2	To provide insights on computer-assisted tools and types of automated tools.										
C3	To throw light on review and selection fact-finding techniques.										
C4	To elucidate on the essentials of design designing effective output.										
C5	To create awareness and importance on software design & documentation and case studies on various domains.										
SYLLABUS											
UNIT	Details							No. of Hours	Course Objectives		
I	System Analysis Fundamentals: Introduction to System, System Analysis and Design, Need for System Analysis and Design, Role of the System Analyst System Development Strategies: SDLC, Structured Analysis Development Method, System Prototype Method.							9	C1		
II	Case Tools:Benefits of Computer-Assisted Tools, Categories of Automated Tools, Case Components Organizations as System: Interrelatedness and Interdependence of System, System Process, Boundaries, System Feedback, Managing Project.							9	C2		
III	Review and Selection Fact-Finding Techniques:Interview, Questionnaire, Record Review, Observation Data Flow Diagram: Advantages, Notations, Rules, Leveling, Logical and Physical DFD. Data Dictionary: Importance, Data Elements, Describing Process Specification Structured Decisions: Decision Tree, Decision Tables, Structured English.							9	C3		
IV	The Essentials of Design Designing Effective Output:Objectives, Types of Output, Method, Factors to consider - Designing Effective Input: Objectives, Guideline for Form design, Screen and Web Forms, Designing User Interface: Objectives, Types of user interface, Designing Accurate Data – Entry Procedures: Objectives, Effective coding, Data-Entry							9	C4		

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	Method, Ensuring data quality through input validation		
V	Quality Assurance through Software Engineering - Design of Software, Software design and documentation: Structured Flowcharts, HIPO, Warnier /Orr Diagrams Managing Quality Assurance: Level of Assurance, Level of Test Implementation of Information System: Training Strategies, Conversion, Post Implementation Review - Case Studies - Financial Accounting System - Payroll System – Library System - Inventory System - Online Banking System - Railway Reservation system(Input, Output, DFD)	9	C5
	Total	45	
Course Outcomes			
Course Outcomes	On completion of this course, students will;	Program Outcomes	
CO1	Recall the fundamentals of system analysis and design.	P01, P02	
CO2	Describe the computer-assisted tools and types of automated tools.	P02, P06	
CO3	Analyse the review and selection of fact-finding techniques.	P01, P04	
CO4	Formulate the essentials of designing effective output.	P02, P06	
CO5	Organise your understanding on software design & documentation and case studies on various domains.	P01, P06	
Reading List			
1.	Finite Elements in Analysis and Design, Elsevier		
2.	Formal Methods in System Design, Springer		
3.	Journal of Systems and Software, Elsevier		
4.	Telecommunication Systems - Modelling, Analysis, Design and Management, Springer		

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	Text book
1	V Rajaraman; Analysis and Design of Information Systems; PHI; 2018
2	J B Dixit; Structured system Analysis and Design ; Laxmi Publications; 2007
3	AruneshGoyal; System Analysis and Design ; PBI Learning; 2011
4	Dr V k Jain; System Analysis and Design handbook; Dreamtech Press; 2000
5	Preeti Gupta; Structured System Analysis and Design; Firewall Media; 2005
References Books	
1.	Hoffer J. A, George J.F, Valacich J.S, Modern Systems Analysis and Design, Pearson Education, 6 th Edition, 2011
2.	Alan Dennis and Barbara Wixom, Roberta M. Roth, Systems Analysis and Design, Wiley, 2018.
3.	Whitten J. L, Bentley L. D, Systems Analysis and Design Methods, McGraw Hill, 2005.
4.	Kenneth E. Kendall, Julie E. Kendall, Systems Analysis and Design, Pearson
5.	Elias M. Awad, System Analysis and Design, Galgotia Publications Pvt. Ltd, 2010

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S					S		
CO 2		S				S		
CO 3	M			S				
CO 4		M				M		
CO 5	S					S		

S-Strong M-Medium L-Low

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916C	Decision Support System	Elective	3	-	-	-	3	45	25	75	100
Course Objectives											
C1	To provide insights on components and characteristics of DSS.										
C2	To throw light on modeling process, model directory and model base management system.										
C3	To familiarize on data structure and data base languages.										
C4	To create awareness and importance of dialog management, user interface and										
C5	To elucidate on development of decision support system.										
SYLLABUS											
UNIT	Details							No. of Hours	Course Objectives		
I	Introduction: Decision concept – Steps – Decision Support System – Components – Characteristics – Classifications and Applications.							9	C1		
II	Model Management: Model – Modeling Process – Types of Models – Optimization – Simulation – Heuristic: Descriptive – Predictive Model Base – Modeling Languages – Model Directory, Model Base Management System – Model Execution, Integration and Command Processing – Model Packages.							9	C2		
III	Data Management System: Data Base – Sources of Data – Data Directory – Data Structure and Data Base Languages – Query Facility – Data Management System – DBMS as DSS Development Tool.							9	C3		
IV	Dialog Management: User Interface – Graphics – Multimedia – Visual Interactive Modeling – Natural language processing – Speech Recognition and Understanding – Issues in User interface.							9	C4		
V	Development of Decision Support System: Development Process – Software and Hardware; Data Acquisition – Model Acquisition – Dialog development – Integration – Testing and Validation – Training and Implementation.							9	C5		
	Total							45			
Course Outcomes											
Course Outcomes	On completion of this course, students will;							Program Outcomes			

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CO1	Have insights on components and characteristics of DSS.	P01, P02
CO2	Possess knowledge on DSS architecture; approaches to development; and models in DSS.	P02, P04
CO3	Possess knowledge on Group DSS and Executive Information Systems (EIS).	P01, P05
CO4	Have better understanding on AI and expert	P02, P06
CO5	Learn and understand on development of decision support system.	P01, P06

Reading List

1.	Decision Support Systems and Electronic Commerce, Elsevier
2.	Decision Support Systems, Science Direct
3.	Decision Sciences – Wiley Online Library
4.	Soft Computing - A Fusion of Foundations, Methodologies and Applications Springer

Text Books

1	Sitansu S Mittra; Decision Support Systems: Tools and Techniques; Wiley; 1986
2	Ramanathan Sugumaran; John Degroote; Spatial Decision Support System: Principles and Practices; Taylor and Francis; 2011
3	V S Janakiraman; Sarukesi, K; Decision Support Systems; PHI; 2008
4	B Ravindranath; Decision Support Systems and Data Warehouses; NewAge International; 2003

References Books

1.	Efraim Turban, Jay E. Aronson, Ting-Peng Liang, Ramesh Sharda, Decision Support & Business Intelligent Systems, Pearson Education, 8 th Edition, 2007
2.	Mallach, Efrem G, Decision Support & data Warehouse Systems –McGraw-Hill, 2002
3.	Marakas, George. M, Decision Support Systems in the 21st century – Pearson Education, 1999
4.	Daniel J Power, Decision Support Systems – Concepts and Resources for Managers: Quorum Books, 2002
5.	Efraim Turban, Ramesh Sharda, Dursun Delen, Business Intelligence and Analytics – Systems for decision support, Pearson, 2018

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S	M						
CO 2		S		S				
CO 3	M				S			
CO 4		M				S		
CO 5	S					M		

S-Strong M-Medium L-Low

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916D	E-Business	Elective	3	-	-	-	3	45	25	75	100
Course Objectives											
C1	To familiarize the students on the web designing software tools.										
C2	To provide insights on data warehousing and application of e-commerce in various sectors.										
C3	To throw light on E-Marketing and ERP tools & modules										
C4	To elucidate on E-security, Internet governance and cyber law issues.										
C5	To create awareness and importance of E-commerce in service sector; and										
SYLLABUS											
UNIT	Details							No. of Hours	Course Objectives		
I	Introduction : Introduction to World Wide Web – Intelligent Web Designing – Software Tools – IP, TCP, HTTP, HTML, Cryptography – Consumer Interface Technologies – OLAP and Data Mining							9	C1		
II	Principles – Potential – Knowledge Management – Data Warehousing – Application of E-Commerce in Different Sector – Service, Industry, Domestic – Multidisciplinary Approach to E-Commerce, Customer Relation Management.							9	C2		
III	Business Model – E-Marketing – Intelligent Agents – Economics in E-Commerce – Equilibrium Price – Supply Chain Management – ERP Tools and Modules – Opportunities and Challenges – Mobile Commerce							9	C3		
IV	Online Payment – E-Security – Security Protocols – How sites are hacked – Internet Governance – Firewall Legal Issues: Software Intellectual Property Law – Contract Law for E-Business – Cyber Law Issues - Interpol							9	C4		
V	E-Commerce Industries: Online Retail Sector – Online Financial Services – Online Travel Services – Online Career Services – Online Publishing – Online Entertainment Consumer Protection: Privacy and Information Rights – Warranties and New Products.							9	C5		
	Total							45			

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Course Outcomes			
Course Outcomes	On completion of this course, students will;	Program Outcomes	
CO1	Summarise the knowledge on the web designing software tools.	P05, P06, P07	
CO2	Describe the application of data warehousing and of e-commerce in various sectors.	P02, P04	
CO3	Explain the tools of E-Marketing and ERP & its modules.	P02, P06	
CO4	Interpret the issues associated with E-security, Internet governance and cyber law.	P02, P03, P06, P07	
CO5	Explain the role of E-commerce in service sector; and privacy & information rights	P04, P06	
Reading List			
1.	Information Systems and e-Business Management, Springer		
2.	Electronic Commerce Research, Springer		
3.	Dien D. Phan , E-Business Management Strategies: A Business-To-Business Case Study, Information Systems Management, Taylor & Francis		
4.	E-business model design, classification, and measurements, Thunderbird International Business Review, Wiley Online Review		
	Text Books		
1.	Joseph P T, “E-Commerce: An Indian Perspective”, PHI Publications, 5th Edition, 2015.		
2.	UrmiDatta&NehaSomani, “E-commerce and Business Communication”, Oxford University Press, 1st Edition, 2017		
3	E commerce: An Introduction;AmirManzoor; Lambert Academic Publishing; 2019		
4	MamtaBhusry; E Commerce; Firewall Media; 2005		
5	V Rajaraman; Essentials of E Commerce Technology; PHI Learning; 2009		
References Books			
1.	David Whiteley, “E-Commerce: Strategy, Technologies and Applications”, Indian Edition, McGraw Hill Publications, 2017.		
2.	Jelassi, Tawfik, Martínez-López, Francisco J, “Strategies for e-Business - Concepts and Cases on Value Creation and Digital Business Transformation”,		
3.	Kenneth C Laudon and Carol GuercioTraver, “E-Commerce – Business, Technology, Society”, Pearson Publication, 15th Edition, 2019.		

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CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1					M	M	M	
CO 2		S		M				
CO 3		M				S		
CO 4		S	S			S	S	
CO 5				M		M		

S-Strong

M-Medium

L-Low

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916E	Internet of Things (IoT)	Elective	3	-	-	-	3	45	25	75	100
	Course Objectives										
C1	To provide insights to the students on the basic concepts of IoT										
C2	To throw light on the various models related to IoT architecture.										
C3	To familiarize on the design and building blocks of IoT.										
C4	To create awareness and importance of data analytics tools for IoT.										
C5	To elucidate on IoT related case-studies and real world applications.										
SYLLABUS											
UNIT	Details							No. of Hours	Course Objectives		
I	Introduction: Evolution of Internet of Things - Physical Design of IoT - Logical Design of IoT - IoT Enabling Technologies - IoT Levels and Deployment Templates - Domain Specific to IoTs.							9	C1		
II	IoT Architecture: ETSI, IETF, OGC architectures - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture.							9	C2		
III	Building IoT: IoT Systems - Logical Design using Python - IoT Physical Devices and Endpoints: What is an IoT Device - Basic building blocks of an IoT device - Exemplary Device: Raspberry Pi - Programming Rashberry Pi with Python - Other IoTDevices.							9	C3		
IV	IoT Data Platform: Data Analytics for IoT: Introduction - Apache Hadoop - Using Hadoop Map Reduce for Batch Data Analysis - Apache Oozie - Apache Spark - Tools for IoT - Introduction - Chef: Setting up Chef.							9	C4		
V	Case Studies and Real-World Applications: Real world design constraints - IoT Physical Servers & Cloud Offerings - Case Studies Illustrating IoT Design: Introduction - Asset management – Smart Cities - Environment - Productivity Applications.							9	C5		
		Total					45				

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	Course Outcomes	
Course Outcomes	On completion of this course, students will;	Program Outcomes
CO1	Infer the basic concepts of IoT.	P04, P06
CO2	Comparison on the various models related to IoT architecture.	P02, P04, P05
CO3	Recall the design and building blocks of IoT.	P01, P02, P06, P07
CO4	Assess the importance of data analytics tools for IoT.	P02, P06, P07
CO5	Analyse the IoT related case-studies and real world applications.	P01,P02,P03,P06, P07
Reading List		
1.	Internet of Things – Science Direct	
2.	International Journal of Internet of Things and Cyber-Assurance, Inderscience	
3.	S Li, LD Xu, S Zhao, The internet of things: a survey, , Information systems frontiers, Springer	
4.	F Wortmann, K Flüchter ,Internet of things - Business & Information Systems Engineering, Springer	
	Text Books	
1.	ArshdeepBahga, Vijay Madiseti, - Internet of Things – A hands-on approach, University Press, 2015	
2	DrKamleshLakhwani; DrHemant Kumar Gianey; Joseph KoftWireko; Internet of Things; BPB Publications; 2020	
3	Sunil Cheruvu; Anil Kumar; Ned Smith; Demystufying Internet of Things Security: Successful IoT; Apress; 2019	
4	RajkumarBuyya; Amir VahidDastjerdi; IoT: Principles and Paradigms; Elsevier; 2016	
5	AbhikChaudhry; Internet of things, for things and by things; Taylor and Francis; 2019	
References Books		
2.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Thingsl, Springer, 2011.	
3.	Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspectivel, CRC Press, 2012.	
4.	Jan Holler, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, StefaAvesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a	
5.	Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocolsl, Wiley, 2012	
6.	Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, John Wiley & Sons, 2013.	

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CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1				S		S		
CO 2		M		S	S			
CO 3	S	S				M	M	
CO 4		M				S	S	
CO 5	S	S	S			M	S	

S-Strong

M-Medium

L-Low

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916F	Cloud Computing	Elective	3	-	-	-	3	45	25	75	100
Course Objectives											
C1	To familiarize the students on the history and models of cloud computing.										
C2	To provide insights on characteristics, challenges and virtualization concepts of cloud computing.										
C3	To throw light on cloud computing applications such as Amazon AWS, Microsoft Azure and Google App Engine.										
C4	To elucidate on cloud access, cloud provenance and cloud security.										
C5	To create awareness and importance of governance and the future of cloud based system in organization.										
SYLLABUS											
UNIT	Details							No. of Hours	Course Objectives		
I	History of Cloud Computing: History of Centralized and Distributed Computing - Overview of Distributed Computing, Cluster computing, Grid computing. Technologies for Network based systems- System models for Distributed and cloud computing- Software environments for distributed systems and clouds.							9	C1		
II	Introduction to Cloud Computing: Introduction to Cloud Computing- Cloud issues and challenges - Properties - Characteristics - Service models, Deployment models. Cloud resources: Network and API - Virtual and Physical computational resources - Data-storage. Virtualization concepts - Types of Virtualization- Introduction to Various Hypervisors - High Availability (HA)/Disaster Recovery (DR) using Virtualization, Moving VMs .							9	C2		
III	Cloud Computing Applications: Cloud Programming and Software Environments – Parallel and Distributed Programming paradigms – Overview on Amazon AWS and Microsoft Azure – Overview on Google App Engine – Emerging Cloud software Environment.							9	C3		

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IV	Cloud Security: Cloud Access: authentication, authorization and accounting - Cloud Provenance and metadata - Cloud Reliability and fault-tolerance - Cloud Security, privacy, policy and compliance Cloud federation, interoperability and standards.	9	C4
V	Governance and the future of Cloud: Organizational Readiness and Change Management in the Cloud Age, Legal Issues in Cloud Computing, Achieving Production Readiness for Cloud Services, How Cloud Will Change Operating Systems, Future of Cloud TV & Cloud-Based Smart Devices, Cloud and Mobile, Home-Based Cloud Computing.	9	C5
	Total	45	
Course Outcomes			
Course Outcomes	On completion of this course, students will;	Program Outcomes	
CO1	Quote on the history and models of cloud computing.	P04, P06, P07, P08	
CO2	Analyse the characteristics, challenges and virtualization concepts of cloud computing.	P01, P04, P05	
CO3	Comprehend on cloud computing applications such as Amazon AWS, Microsoft Azure and Google App Engine.	P01, P02, P03, P06, P07	
CO4	Compare and contrast on cloud access, cloud provenance and cloud security.	P05, P06, P07. P08	
CO5	Organise your thoughts on governance and the future of cloud based system in organization.	P01,P02,P03,P04, P07	
Reading List			
1.	Journal of Cloud Computing, Advances, Systems and Applications, Springer Open		
2.	Special Issue on Cloud-based Media Computing and Communications, Computer Communications, Elseiver		
3.	L Qian, Z Luo, Y Du, L Guo , Cloud computing: An overview, international conference on cloud computing, 2009 - Springer		
4.	Lizhe Wang, Gregor von Laszewski, Andrew Younge, Xi He, Marcel Kunze, Jie Tao & Cheng Fu, Cloud Computing: a Perspective Study, New Generation Computing, Springer		

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Text Books	
1.	Kris Jamsa, Cloud Computing, Jones & Bartlett Learning, 2013
2.	Kumar Saurabh, Cloud Computing – Insights into new era infrastructure, Wiley India, 2nd Edition, 2012
3.	Rao, M N ; Cloud Computing; Prentice Hall India; 2015
4.	Pandey, U S; Chaudhary, Kavita; Cloud Computing; S chand and company; 2014
5.	Nayan B Ruparelia; Cloud computing; MIT Press; 2016
References Books	
1.	RajkumarBuyya, James Broberg and AndrzejGoscinski, Cloud Computing – Principles and Paradigms, John Wiley & Sons, 2011
2.	Barrie Sosinsky, “ Cloud Computing Bible” John Wiley & Sons, 2011
3.	Tim Mather, SubraKumaraswamy, and ShahedLatif, Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance, O'Reilly, 2009
4.	Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, Distributed and cloud computing from Parallel Processing to the Internet of Things, Morgan Kaufmann,

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1				S		M	S	S
CO 2	S			M	S			
CO 3	M	S	S			S	M	
CO 4					S	M	S	S
CO 5	S	M	M	S			S	

S-Strong M-Medium L-Low

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916G	Enterprise Resource Planning (ERP)	Elective	3	-	-	-	3	45	25	75	100
Course Objectives											
C1	To familiarize the students to the basics of ERP models, structures and										
C2	To brief the advancement of IT and data management										
C3	To throw light on ERP marketplace dynamics										
C4	To elucidate on implementation of ERP										
C5	To orient to open source ERP and future directives										
SYLLABUS											
UNIT	Details						No. of Hours		Course Objectives		
I	ERP Introduction: Origin, Evolution and Structure and Benefits: o Conceptual Model of ERP, Scenario and Justification of ERP in India, Various Modules of ERP, Advantage of ERP.						9		C1		
II	Advancement of IT and Impact on organizations data management: Data warehousing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM).						9		C2		
III	ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, and The changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software Integration of ERP, Supply chain and Customer Relationship Applications.						9		C3		
IV	ERP Implementation: Business Process mapping and re-engineering, ERP Implementation Life Cycle, Role of Consultants, Vendors and Employees. Critical Success Factors: Guiding Selection and Evaluation of ERP, Strategies and CSF for Successful ERP Implementation, Causes of ERP Failure.						9		C4		
V	Practical Module: ERP & E-Commerce, Future Directives- in ERP, Integrating ERP into organizational culture. Using an open source ERP tool for orienting students to ERP.						9		C5		
	Total						45				

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Course Outcomes			
Course Outcomes	On completion of this course, students will;	Program Outcomes	
CO1	Define the basics of ERP models, structures and advantages	P01, P02, P07	
CO2	Comprehend and categorize the advancement of IT and data management	P05, P06, P07	
CO3	Summarise the ERP marketplace dynamics	P01, P02, P07	
CO4	Compare and design implementation of ERP	P01, P02, P05. P06	
CO5	Contrast and use open source ERP towards future directives	P03, P04,P05, P07, P08	
Reading List			
1.	Business Process Management Journal, Emerald insight		
2.	Journal of Business Research, Elsevier		
3.	T Huang, K Yasud, Comprehensive review of literature survey articles on ERP - Business Process Management Journal, Emerald		
4.	H Klaus, M Rosemann, GG Gable, What is ERP?, Information systems frontiers, Springer		
	Text Books		
1.	Enterprise Resource Planning (ERP) Text and Case Studies, Mr. C.S.V. Murthy, Himalaya Publication, 2008.		
2.	Dr. Ashim Raj Singla, Enterprise Resource Planning 2 nd Edition, Cengage Learning, 2019.		
3.	S. Sadagopan, ERP-A Managerial Perspective, McGraw Hill,1999.		
4.	K Ganesh; Sanjay Mohapatra; AnbuShankar,S P; Enterprise Resource Planning: Fundamentals of Design and Implementation; Springer; 2014		
5.	S Parthasarathy; Enterprise Resource Planning: A Managerial and Technical Perspective; NewAge Publications; 2007		
References Books			
1.	Alexis Leon , Enterprise Resource Planning McGraw Hill, 2 nd Edition, 2018		
2.	David L. Olson , Managerial Issues of Enterprise Resource Planning Systems, McGraw Hill, 2008.		
3.	F. Robert Jacobs and D. Clay Whybark, Why ERP? A primer on SAP Implementation, McGraw Hill, 2000.		

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CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S	S					M	
CO 2					S	S	M	
CO 3	M	S					S	
CO 4	S	M			S		S	S
CO 5			S	M	M		M	S

S-Strong

M-Medium

L-Low

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916H	Software Project and Quality management	Elective	3	-	-	-	3	45	25	75	100
Course Objectives											
C1	To comprehend and reflect on overview of project planning, project evaluation, project analysis and technical planning, software estimation										
C2	To elaborate and critically analyze Resource scheduling and management, CMM, key process indicators, process monitoring and control.										
C3	To generate and align Critical Chain Project Management, Test Maturity Model & Six Sigma and collate reports.										
C4	To evaluate existing Adaptive Project Framework and build quality models based on Six Sigma & Lean Process Model.										
C5	To contrast Software configuration management processes and audit quality standardisations.										
SYLLABUS											
UNIT	Details						No. of Hours	Course Objectives			
I	Introduction:Project Overview - Traditional Project Management - Scoping the Project - Identifying Project Activities-An overview of project planning, project evaluation, project analysis and technical planning, software estimation. Organizational quality goals, policy, quality plans, certification, accreditation, process measurements, audits.						9	C1			
II	Requirements: Estimating Duration, Resource Requirements and Cost - Constructing and Analyzing the Project Network Diagram - Finalizing the Schedule and Cost Based on Resource Availability - Organizing and Conducting the Joint Project Planning Session. Capability Maturity Model: CMM & CMMI, goals, commitment, ability, measurement & verification, maturity levels, key process areas, key process indicators, process monitoring and control.						9	C2			
III	Project Teams: Recruiting Organizing and Managing the Project Team - Monitoring and Controlling Progress - Closing out the Projects - Critical Chain Project Management - Activity planning, project schedules, sequencing and scheduling projects. Test Maturity Model						9	C3			

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	& Six Sigma: Overview, Key Process Areas, TPI framework of test quality, levels of maturity, assessment, analysis, reporting.		
IV	Framework: Introduction to the Adaptive Project Framework - Version Scope - Cycle Plan - Cycle Build - Client Checkpoint - Post-Version Review - network planning model, shortening project duration, Identifying critical activities. Six Sigma & Lean Process Model: quality criteria, quality metrics, frameworks, process wastages, operational processes, guidelines and templates	9	C4
V	Standardisations: Variations to APF- Software configuration management, Basic functions, Responsibilities, standards configuration management, prototyping, models of prototyping. Organizational Considerations - Project Portfolio Management - Project Support Office Case study - PRINCE Project management standards. Audits: ISO, CMM, People CMM, TMM, Six Sigma.	9	C5
	Total	45	
Course Outcomes			
Course Outcomes	On completion of this course, students will;	Program Outcomes	
CO1	Comprehend and reflect on overview of project planning, project evaluation, project analysis and technical planning, software estimation	P01, P02, P06, P07	
CO2	Critically analyze Resource scheduling and management, CMM, key process indicators, process monitoring and control.	P05, P06, P07	
CO3	Generate and align Critical Chain Project Management, Test Maturity Model & Six Sigma and collate reports.	P01, P02, P06	
CO4	Evaluate existing Adaptive Project Framework and build quality models based on Six Sigma & Lean Process Model.	P01, P02, P05. P06	
CO5	Contrast and conclude Software configuration management processes and audit quality standardisations.	P04, P05, P07, P08	
Reading List			
1.	Software Quality Journal, Springer		
2.	International Journal of Project Management, Elsevier		

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3.	MJ Parzinger, R Nath, A study of the relationships between total quality management implementation factors and software quality, Total quality management, Taylor & Francis
4.	K Kautz, EÅ Larsen Diffusion theory and practice: Disseminating quality management and software process improvement innovations, Information Technology & People, Emerald
Text Books	
1	Ashfaqe Ahmed; Software Project Management: A process driven approach; T& F; 2011
2	PankajJalote; Software Project Management in Practice; Pearson Education ; 2002
3	PriyadarshiniTripathy; KshirasagarNaik; Software Testing and Quality Assurance; Wiley Publishing; 2011
4	Bharat BhushanAgarwal; ShivangiDhall; Software Project Management; Laxmi Publication; 2011
5	K K Singh; Akansha Singh; software Project management; Umesh Publication; 2011
References Books	
1.	Richard L. Chamberlain, Planning Quality Project Management of (EMR/EHR) Software Products (HIMSS Book Series), CRC Press, 1 st Edition 2017.
2.	Ronald Cummings - John, Owais Peer, Leading Quality: How Great Leaders Deliver High Quality Software and Accelerate Growth, ROI Press,1 st Edition 2019.
3.	Greg Caldwell, Lean Mastery: 8 Books in 1 - Master Lean Six Sigma & Build a Lean Enterprise, Accelerate Tasks with Scrum and Agile Project Management, Optimize with Kanban, and Adopt The Kaizen Mindset, Greg Caldwell Publishing, 1 st Edition 2020.
4.	Tom C. Witt, IT Best Practices: Management, Teams, Quality, Performance, and Projects, CRC Press,1 st Edition 2018.
5.	Linda Westfall, The Certified Software Quality Engineer Handbook, ASQ Quality Press, 2 nd Edition, 2017.
6.	Stephan Goericke, The Future of Software Quality Assurance, 1 st 2020, Springer Open.

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S	M				M	S	
CO 2					S	M	S	
CO 3	M	S				S		
CO 4	S	M			S	S		
CO 5				S	M		S	S

S-Strong M-Medium L-Low

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916I	Data Warehousing	Elective	3	-	-	-	3	45	25	75	100
Course Objectives											
C1	To provide insights to the characteristics and architecture of data warehouse.										
C2	To throw light on the fundamentals, classification and major issues in data mining.										
C3	To familiarize on APRIORI principle & Algorithm and Association rule										
C4	To create awareness and importance of classification techniques, decision tree										
C5	To elucidate on the various clustering techniques.										
SYLLABUS											
UNIT	Details							No. of Hours	Course Objectives		
I	Data warehouse: Introduction to Data warehouse, Difference between operational database systems and data warehouses, Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction-Transformation-Loading, Logical(Multi-Dimensional), Data Modeling, Schema Design, Star and Snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; Fact-Less-Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.							9	C1		
II	Data Mining: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration &Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.							9	C2		
III	Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed							9	C3		

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	Frequent Item Set.		
IV	Classification: Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers , Classification techniques, Decision Trees-Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics, prediction: Accuracy and Error measures, Evaluating the accuracy of a classifier or a predictor, Ensemble methods.	9	C4
V	Clustering: Clustering Overview, A Categorization of Major Clustering Methods, partitioning methods, hierarchical methods, , partitioning clustering-k-means algorithm, pam algorithm; hierarchical clustering-agglomerative methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Key Issues in Hierarchical Clustering, Strengths and Weakness, Outlier Detection.	9	C5
	Total	45	
Course Outcomes			
Course Outcomes	On completion of this course, students will;	Program Outcomes	
CO1	Have insights to the characteristics and architecture of data warehouse.	P05, P06, P07	
CO2	Possess knowledge on the fundamentals, classification and major issues in data mining.	P01, P02, P06	
CO3	Possess knowledge on APRIORI principle & Algorithm and Association rule generation.	P01, P02, P06, P07	
CO4	Have better understanding on classification techniques, decision tree and Bayesian Belief Networks.	P01, P05. P06	
CO5	Learn and understand the various clustering techniques.	P04, P05, P07,	
Reading List			
1.	Data Mining and Knowledge Discovery, Springer		
2.	International Journal of Information Management, Science Direct		
3.	BH Wixom, HJ Watson, An empirical investigation of the factors affecting data warehousing success, MIS quarterly, JSTOR		
	Text Books		

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1.	P Chandra, MK Gupta, Comprehensive survey on data warehousing research, International Journal of Information Technology, Springer
2.	PaulrajPonniah, Data warehousing Fundamentals, Wiley Publications. 2 nd Edition, 2012
3	Parteek Bhatia; Data mining and data warehousing; Principles and Practical applications; Cambridge University Press; 2019
4	Arshad khan; Data warehousing 101 : Concepts and Implementation; iUniverse; 2003
5	Prabhu CSR; Data warehousing: Concepts, Techniques and Products; PHI Universal; 2008
References Books	
1.	George M. Marakas, Modern Data Warehousing, Mining and Visualization, Pearson Publications. 3 rd Impression, 2009
2.	Jaiwei Ham and MichelineKamber, Data Mining concepts and techniques, Kauffmann Publishers, 2006
3.	W.H.Inmon, Building the Data Warehouse, 4th edition Wiley India Pvt. Ltd, 2005.
4.	Michel Berry and Gordon Linoff, Data mining techniques for Marketing, Sales and Customer support, John Wiley, 2011

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1					S	M	S	
CO 2	M	S				M		
CO 3	S	S				S	M	
CO 4	S				S	S		
CO 5				S	M		S	

S-Strong M-Medium L-Low

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Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	Marks		
									CIA	External	Total
934E916J	Deep Learning And Artificial Intelligence	Elective	3	-	-	-	3	45	25	75	100
Course Objectives											
C1	To familiarize the students on the modern practices of deep forward networks.										
C2	To provide insights on deep models, optimization techniques and algorithms with adaptive learning rates.										
C3	To throw light on foundation and applications of AI.										
C4	To elucidate on the approaches to knowledge representation.										
C5	To create awareness and importance of applications of expert systems and machine learning paradigms.										
SYLLABUS											
UNIT	Details							No. of Hours	Course Objectives		
I	Deep Networks: Deep Networks: Modern Practices: Deep Forward Networks: Example: Learning XOR - Gradient-Based Learning - Hidden Units - Architecture Design - Regularization for Deep Learning.							9	C1		
II	Models: Optimization for Training Deep Models: How Learning Differs from Pure Optimization -Challenges in Neural Network Optimization - Basic Algorithms - Parameter Initialization Strategies - Algorithms with Adaptive Learning Rates - Approximate Second-Order Methods - Optimization Strategies and Meta-Algorithms							9	C2		
III	Intelligent Systems: Introduction to Artificial Intelligence: Intelligent Systems - Foundations of AI - Applications -Tic-Tac-Toe Game Playing - Problem Solving: State-Space Search and Control Strategies: Introduction - General Problem Solving - Exhaustive Searches - Heuristic Search Techniques.							9	C3		
IV	Knowledge Representation: Advanced Problem-Solving Paradigm: Planning: Introduction - Types of Planning Systems -Knowledge Representation: Introduction - Approaches to Knowledge Representation -Knowledge Representation using Semantic Network - Knowledge Representation using Frames.							9	C4		

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V	Applications: Expert Systems and Applications: Blackboard Systems – Truth Maintenance Systems – Applications of Expert Systems – Machine-Learning Paradigms: Machine-Learning Systems – Supervised and Unsupervised Learnings.	9	C5
	Total	45	
Course Outcomes			
Course Outcomes	On completion of this course, students will;	Program Outcomes	
CO1	Identify the modern practices of deep forward networks.	P01, P02, P05, P07	
CO2	Explain the deep models, optimization techniques and algorithms with adaptive learning rates.	P01, P02, P04, P06	
CO3	Summarise on the foundation and applications of AI.	P04, P05, P06, P07	
CO4	Criticise the approaches to knowledge representation.	P02, P06. P07	
CO5	Organise the applications of expert systems and machine learning paradigms.	P04, P05, P07, P08	
Reading List			
1.	Artificial Intelligence – Elsevier		
2.	International Journal of Machine Learning and Cybernetics, Springer		
3.	DM Dimiduk, EA Holm, SR Niezgoda, Perspectives on the impact of machine learning, deep learning, and artificial intelligence on materials, processes, and structures engineering, Integrating Materials and and Manufacturing Innovation volume 2018 - Springer		
	Text Books		
1.	SarojKaushik, "Artificial Intelligence", Cengage Learning India Pvt. Ltd, 2011		
2.	Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education (India) Private Limited, New Delhi, 2013		
3.	Elaine Rich, Kevin Night, Shivashankar B Nair, "Artificial Intelligence" 3 rd Edition, McGraw Hill, 2008.		
4.	A Sujith, GS Sajja, V Mahalakshmi, S Nuhmani, Systematic review of smart health monitoring using deep learning and Artificial intelligence, Neuroscience Informatics, Elsevier		
5.	Kanimozhi S; Suguna; Dhivya; Paiva, Sara; Artificial Intelligence: Recent trends and Applications; CRC Press; 2021		
References Books			

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1.	Ian Goodfellow, YoshuaBengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
2.	Li Deng and Dong Yu, "Deep Learning Methods and Applications", Foundations and Trends in Signal Processing, 2014.
3.	YoshuaBengio, "Learning Deep Architectures for AI", Foundations and Trends in Machine Learning, 2009

CO-PO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S	S			S		M	
CO 2	M	S		S		S		
CO 3				M	S	M	S	
CO 4		S				S	S	
CO 5				S	M		M	S

S-Strong M-Medium L-Low