Government College of Engineering, Karad

SCHEME OF INSTRUCTION & SYLLABI

Programme: Master of Computer Applications

Scheme of Instructions: Second Year MCA (W.E.F. A.Y. 2021-22)

Semester – III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs / Wk.	Course Credits	EXAM SCHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	PCC	MC2301	Data Science	3	-	-	3	3	15	15	10	60	100
2	PCC	MC2302	Mobile Technologies	3	-	-	3	3	15	15	10	60	100
3	ESC	MC2303	Information Security	3	-	-	3	3	15	15	10	60	100
4	PEC	MC23*4	Elective-II	3	-	-	3	3	15	15	10	60	100
5	PEC	MC23*5	Elective-III	3	-	-	3	3	15	15	10	60	100
6	PCC	MC2306	Data Science Lab	-	-	2	2	1	-	-	50	-	50
7	PCC	MC2307	Mobile Technologies Lab	-	-	2	2	1	-	-	50	-	50
8	PCC	MC2308	IoT Lab		-	2	2	1	-	-	25	25	50
9	P/S/IT	MC2309	Software Development Project Lab	-	2	4	6	4	-	-	50	50	100
10	MCC	MC2310	SWAYAM/MOOC COURSE	-	-	-	-	1	-	-	-	-	-
11	HSMC	MC2311	Professional Communication		-	4	4	2	-	-	25	25	50
			Total	**15**	**2**	**14**	**31**	**25**	**75**	**75**	**250**	**400**	**800**

L- Lecture T-Tutorial P-Practical

CT1- Class Test 1 TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2 ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core Courses)	PEC (Programme Elective Courses)	OEC (Open Elective courses from other discipline)	MCC (Mandatory Courses)	Project / Seminar / Industrial Training
Credits	02	--	03	09	6	--	1	4
Cumulative Sum	03	06	17	35	6	--	1	5

PROGRESSIVE TOTAL CREDITS: 48+25=73

Government College of Engineering, Karad

SCHEME OF INSTRUCTION & SYLLABI

Programme: Master of Computer Applications

Scheme of Instructions: Second Year MCA

Semester – IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs / Wk	Course Credits	EXAM SCHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	P/S/IT	MC2401	Industrial Project	-	-	4	20	10	-	-	100	100	200
2	P/S/IT	MC2402	Seminar	-	-	2	04	02	-	-	50	-	50
			Total	**-**	**-**	**6**	**24**	**12**	**-**	**-**	**150**	**100**	**250**

L- Lecture T-Tutorial P-Practical

CT1- Class Test 1 TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2 ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum., Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core courses)	PEC (Programme Elective courses)	OEC (Open Elective courses from other discipline)	MCC (Mandatory Courses)	Project / Seminar / Industrial Training
Credits	00	--	--	-	00	--	--	12
Cumulative Sum	03	06	17	35	06	--	--	16

PROGRESSIVE TOTAL CREDITS: 73+12=85

List of PROGRAM ELECTIVE courses:

Elective – I		Elective – II		Elective – III	
MC2216	Enterprise Resource Planning	MC2314	Artificial Intelligence	MC2315	Data Mining
MC2226	Business process management	MC2324	Soft computing	MC2325	Cloud Computing
MC2236	Optimization Techniques	MC2334	Business Intelligence	MC2335	Big Data Analytics
MC2246	Multimedia systems	MC2344	Digital forensics	MC2345	Advanced Software Engineering

Government College of Engineering, Karad

Second Year (Sem – III) M. C. A.

MC2301: Data Science

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
			CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Understand Data Science and the skillset needed to be a Data Scientist
2.	Understand different tools for Data Science and to create effective visualization of given data (to communicate or persuade).
3.	Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbours (k-NN), k-means, Naive Bayes) for predictive modelling.

	Course Contents	Hours
Unit 1	**Introduction:** What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed, **Statistical Inference** - Populations and samples - Statistical modelling, probability distributions, fitting a model - Intro to R	**(08)**
Unit 2	**Exploratory Data Analysis and the Data Science Process** - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process	**(04)**
Unit 3	**Three Basic Machine Learning Algorithms** - Linear Regression - k-Nearest Neighbours (k-NN) - k-means**, One More Machine Learning Algorithm and Usage in Applications** - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam - Data Wrangling: APIs and other tools for scrapping the Web	**(08)**
Unit 4	**Feature Generation and Feature Selection (Extracting Meaning From Data)** - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests	**(06)**
Unit 5	**Mining Social-Network Graphs** - Social networks as graphs - Clustering of graphs - Direct discovery of communities in graphs - Partitioning of graphs - Neighbourhood properties in graphs	**(06)**
Unit 6	**Data Visualization** - Basic principles, ideas and tools for data visualization - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset **Data Science and Ethical Issues** - Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists	**(08)**

Text Books

1.	Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014.

Reference Books

1.	Jure Leskovec, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2014. (free online)
2.	Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.
3.	Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.
4.	Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. ISBN 0387952845. 2009. (free online)
5.	Avrim Blum, John Hopcroft and Ravindran Kannan. Foundations of Data Science.
6.	Mohammed J. Zakiand, Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press. 2014.
7.	Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. ISBN 0123814790. 2011.

Useful Links

1.	https://machinelearningmastery.com/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	3	0	3	2	3	2	3	3	3	2	2	0	1
CO 2	1	3	2	2	3	0	1	0	0	3	0	0	1	2	0
CO 3	1	1	1	0	3	0	3	0	0	0	0	0	1	3	0

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	-	10
Understand	5	5	2	10
Apply	5	5	3	20
Analyse	-	-	-	-
Evaluate	-	-	2	20
Create	-	-	3	-
TOTAL	15	15	10	60

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Second Year (Sem – III) M.C.A

MC2302:Mobile Technologies

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials			CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Understand the process of developing software for the mobile
2.	Create mobile applications on the Android Platform
3.	Create mobile applications Introduction to ANDROID involving data storage in SQLite database.

	Course Contents	Hours
Unit 1	**Introduction to Mobile Communications and Computing:** Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, New data services. (Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.	**(08)**
Unit 2	**Introduction to ANDROID :** ANDROID SDK Features, Introduction to Development Features. **Basics of ANDROID:** Developing for ANDROID, developing for mobile and embedded devices, ANDROID development tools **Creating Applications using ANDROID:** Basics of an ANDROID application, introduction to manifest, externalizing resources, application life cycle, ANDROID activities	**(08)**
Unit 3	**Building user interfaces:** Introduction to layouts, introduction to fragments, creating new views, introduction to adapters **Intents and broadcast receivers**: Introduction to intents, creating intents and broadcast receivers **Using Internet resources:** Downloading and parsing Internet resources, using the download manager, using Internet services	**(08)**
Unit 4	**Files, saving state and preferences:** Creating, saving and retrieving shares preferences, including static files as resources, working with the file system **Database and Content Providers:** Introducing ANDROID databases, content values and cursors, working with SQLite databases, creating content providers, using content providers, native ANDROID content providers	**(08)**
Unit 5	**Working in Background:** Introducing services, using background threads, using alarms **Enhancing User Experience:** Introduction and addition of action bar, menus and dialogs, drawables and gradients, custom animations **Maps and location based services:** (Using location based services, selecting a location provider, finding your current location, creating map based activities)	**(08)**
Unit 6	**Audio, video and using the camera:** Playing audio and video, manipulating raw audio, using camera to take pictures, recording video, adding media to media store **Telephony and SMS:** Hardware support for telephony, using telephony, introducing SMS and MMS. **Monetizing, promoting and distributing the applications:** Signing and publishing applications, distributing applications, introduction to monetizing applications	**(04)**

Text Books

1.	Reto Meier Professional ANDROID 4 Application Development, WROX Latest Edition

Reference Books

1.	Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011)

2.	Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd (2009)
3.	Sayed Y Hashimi and Satya Komatineni, “Pro Android”, Wiley India Pvt Ltd (2009)
Useful Links	
1.	http://www.tutorialpoints.com/android/ developer.android.com/training/basics/firstapp
2.	http://pl.cs.jhu.edu/oose/resources/android/Android-Tutorial.pdf
3.	https://www.tutlane.com/tutorial/ios/ios-tutorial

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	0	0	1	0	0	0	0	0	3	0	2	2	1	1
CO 2	2	3	3	0	3	0	3	3	2	3	3	2	1	2	0
CO 3	2	3	3	0	3	0	3	3	2	3	3	2	1	2	0

Assessment Pattern (with revised Bloom’s Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	-	10
Understand	5	5	2	10
Apply	5	5	3	20
Analyse	-	-	-	-
Evaluate	-	-	2	20
Create	-	-	3	-
TOTAL	15	15	10	60

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Second Year (Sem – III) M. C. A.

MC2303: Information Security

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
			CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Recount the history of computer security and how it evolved into information security.
2.	Define key terms and understand critical concepts of information security
3.	Classify technologies for network, transport and application layer security.

	Course Contents	Hours
Unit 1	**Information Security:** Introduction: Security mindset, Computer Security Concepts (CIA),Threats, Attacks, and Assets, Model for Information Security	**(06)**
Unit 2	**Symmetric Cryptography:** Concepts and Techniques, Symmetric key Ciphers- Substitution and transposition techniques – Caesar cipher, play fair, mono-alphabetic, steganography, DES structure, DES Analysis, Security of DES, variants of DES, Block cipher modes of operation , Block cipher design principles.	**(08)**
Unit 3	**Asymmetric key cryptography:** AES structure, Analysis of AES , Key distribution Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Analysis of RSA, Diffie-Hellman Key exchange	**(06)**
Unit 4	**Practical Cryptography:** Encryption, authentication, hashing, Digital Signatures and Certificates, Network security issues, Sniffing, IP spoofing	**(06)**
Unit 5	**Security at layers(Network, Transport, Application):** Network security issues, Sniffing, IP spoofing. IPsec, Secure Socket Layer(SSL), Transport Layer Security(TLS), Secure Electronic Transaction(SET), Pretty Good Privacy(PGP), S/MIME	**(08)**
Unit 6	**Intruders, Virus and Firewalls:** Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls	**(06)**

Text Books

1.	Cryptography and Network Security : William Stallings, Pearson Education,4th Edition
2.	Principles of Information Security: Michael E. Whitman, Herbert J. Mattord, CENGAGE Learning, 4th Edition.

Reference Books

1.	Network Security and Cryptography: Bernard Menezes, CENGAGE Learning
2.	Cryptography and Network Security : C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
3.	Introduction to Network Security: Neal Krawetz, CENGAGE Learning
4.	Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH
5.	Handbook of Security of Networks, Yang Xiao, Frank H Li, Hui Chen, World Scientific, 2011.
6.	Cryptography and Network Security : Atul Kahate, McGraw Hill, 2nd Edition

Useful Links

1.	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-858-computer-systems-security-fall-2014/ Computer Systems Security by Prof. Nickolai Zeldovich
2.	http://nptel.ac.in/courses/106106129/ Information Security by Professors at IIT Madras
3.	http://vlab.co.in/ba_labs_all.php?id=2 Information Security Virtual Labs by Professors at IIIT Hyderabad
4.	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-858-computer-systems-security-fall-2014/ Computer Systems Security by Prof. Nickolai Zeldovich

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	3	1	1	0	0	0	0	0	0	1	2	3	1	2
CO 2	2	1	1	2	1	0	0	0	0	0	0	2	1	2	3
CO 3	1	2	1	2	1	0	0	0	0	0	0	1	2	1	2

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	-	10
Understand	5	5	2	10
Apply	5	5	3	20
Analyse	-	-	-	-
Evaluate	-	-	2	20
Create	-	-	3	-
TOTAL	15	15	10	60

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Second Year (Sem – III) MCA

MC2314: (Elective-II) Artificial Intelligence

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
			CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Identify problems that are amenable to solution by AI methods.
2.	Describe appropriate AI methods to solve a given problem and implement basic AI algorithms.
3.	Solve the problems using neural networks techniques and apply fuzzy logic techniques to find solution of uncertain problems.

	Course Contents	Hours
Unit 1	**Introduction of Artificial Intelligence:** What is Artificial Intelligence, Use of AI in daily life, Goals, Application and History of AI, Limitations of AI? **Intelligent Agent:** Agents in AI, Types of AI Agents, Structure of Agents, PEAS Representation, Agent Environment in AI, Features of Environment, Turing Test in AI, Chatbots and features for a machine to pass the Turing test.	**(05)**
Unit 2	**Problem Solving Methods:** Problems, problem spaces and search: Define the problem as a state space search, Production systems, Problem characteristics, Production system characteristic, Issues in design of search program **Search Algorithms:** Terminologies, Properties and features of Search Algorithms, Uninformed and Informed Search Algorithms, Hill Climbing Algorithms	**(07)**
Unit 3	**Representation of Knowledge:** What is Knowledge Representation, what to represent, Types of Knowledge, Knowledge Cycle in AI, Different approaches and Networks of Knowledge representation **Propositional Logic:** Propositional logic in AI, Syntax of propositional logic, Logical Connectives, Precedence, Limitation of Propositional Logic, Inference in AI, Inference Rules and types of Inference Rules, First-order logic, forward and backward chaining in AI	**(08)**
Unit 4	**Reasoning in AI:** Reasoning, Types of reasoning, Uncertainty, Causes of uncertainty, Probabilistic reasoning, Bayes' theorem and Bayesian Belief Network in AI **Neural Network:** Artificial Neural Network, Comparison Between Biological Neuron and Artificial Neuron, Supervised Learning and Unsupervised Learning Networks, Perceptron Networks, Adaline Network, Multiple Adaptive Linear Neurons, and Back-Propagation Network.	**(08)**
Unit 5	**Introduction to Fuzzy Logic:** Introduction to Fuzzy Logic, Classical Sets (Crisp Sets),Fuzzy Sets Classical Relations and Fuzzy Relations: Introduction, Cartesian Product of Relation, Classical Relation, Fuzzy Relations Membership Functions, Fuzzification, Methods of Membership Value Assignments Defuzzification: Introduction, Lambda-Cuts for Fuzzy Sets (Alpha-Cuts), Lambda-Cuts for Fuzzy Relations, Defuzzification Methods	**(06)**
Unit 6	**Genetic Algorithm:** Basic concepts, Difference between genetic algorithm and traditional methods, Simple genetic algorithm, Working principle, Procedures of GA, Genetic operators reproduction, Mutation, crossover. **Subsets of AI:** Subsets of AI, Types of Machine learning, NLP, Deep learning, Expert Systems, Components of Expert Systems, Applications and Limitation of Expert systems.	**(06)**

Text Books

1.	Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Second Edition, Mc Graw Hill- 2008
2.	Stuart Russel, Peter Norvig, "Artificial Intelligence– A Modern Approach", Second Edition, PHI/Pearson Education.

Reference Books

1.	Kumar Satish, "Neural Networks" Tata McGraw Hill
2.	Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India
3.	Artificial Intelligence, 3rd Edition, Elaine Rich, Kevin Knight, S.B. Nair, Tata McGraw Hill
4.	Simon Hhaykin, "Neural networks - A comprehensive foundations", Pearson Education 2nd Edition 2004.

Useful Links

1.	https://www.javatpoint.com/artificial-intelligence-tutorial
2.	https://nptel.ac.in/courses/106/105/106105077/
3.	https://www.vssut.ac.in/lecture_notes/lecture1428643004.pdf

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	2	1	2	0	1	3	1	1	3	2	0	1	0
CO 2	2	1	3	1	2	0	2	0	1	2	1	1	0	2	0
CO 3	0	1	3	2	1	0	2	1	1	1	2	2	0	1	0

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5		10
Understand	5	5	3	20
Apply	5	5	2	10
Analyse	-	-	2	10
Evaluate	-	-	3	10
Create	-	-	-	-
TOTAL	15	15	10	60

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Second Year (Sem – III) M. C. A.

MC2324: (Elective-II)Soft computing

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
			CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2.	Understand artificial neural networks and fuzzy theory from an engineering perspective.
3.	Understand the basics of an evolutionary computing paradigm known as genetic algorithms and its application to engineering optimization problems.

	Course Contents	Hours
Unit 1	**Introduction:** Adaptive systems and Neural Networks, the nature of computation in human brain, a historical tour of brain science, inspiration of neural networks, classical AI and neural networks, difference between soft computing and hard computing.	**(08)**
Unit 2	**Artificial Neural Networks:** Introduction, Fundamental concept, Evolution of Neural Networks, Basic Models of Artificial Neural Networks, Important Terminologies of ANNs, McCulloch-Pitts Neuron, Linear Separability, Hebb Network. Supervised Learning Network: Perceptron Networks, Adaline, Multiple Adaptive Linear Neurons, Back-Propagation Network, And Radial Basis Function Network.	**(08)**
Unit 3	**Introduction to Fuzzy logic ,Classical sets and Fuzzy sets:** Introduction to fuzzy logic, Classical sets (operations, properties, function mapping), Fuzzy sets (operations, properties), fuzzy relations.	**(08)**
Unit 4	**Evolutionary Algorithms:** The hybrid way, Inspiration for evolutionary algorithms, Basic terminology from biology, Evolutionary algorithms: definition and streams, EA's solve optimization problems. **Swarm Intelligence:** Particle Search Optimization, Artificial Bee colony search, Ant colony optimization.	**(08)**
Unit 5	Genetic Algorithm: Introduction, Biological background, Traditional optimization and search techniques, Genetic Algorithm and search space, Genetic Algorithm vs Traditional Algorithms, Basic Terminologies Genetic Algorithm, Operations in Genetic Algorithm.	**(04)**
Unit 6	**Applications of Soft Computing:** A fusion approach of multispectral images with SAR (Synthetic Aperture Radar), GA Based Internet Search Technique; Soft Computing Based Hybrid Fuzzy Controllers.	**(04)**

Text Books

1.	Satish Kumar, Neural networks: A classroom approach, Tata McGraw Hill, 2011.
2.	S. N. Sivanandam, S.N.Deepa "Principles of Soft Computing", Wiley Publication, 2nd edition, 2011. (Unit II, III, V, VI)

Reference Books

1.	David E. Goldberg , Genetic Algorithms in Search, Optimization, and Machine 30 Learning, Addison-Wesley, 1989
2.	B. Yegnanarayana, Artificial Neural Networks, Prentice Hall India, 1999.
3.	S.Rajasekaran, G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 1st edition, 2003
4.	George Klir, Bo Yuan "Fuzzy sets and Fuzzy logic" PHI, 1st edition

Useful Links

1.	https://nptel.ac.in/courses/106/105/106105173/
2.	https://nptel.ac.in/courses/127/105/127105006/
3.	https://nptel.ac.in/courses/117/105/117105084/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	0	2	1	1	1	1	1	1	1	0	1	1	1	0	1
CO 2	2	0	2	2	1	0	1	1	1	0	0	0	1	1	1
CO 3	3	2	3	2	2	0	2	1	1	2	1	1	0	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand	02	02	02	10
Apply	05	05	03	20
Analyse	04	04	03	20
Evaluate	04	04	02	10
TOTAL	15	15	10	60

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MC2334 : (Elective II) Business Intelligence

Teaching Scheme			Examination Scheme	
Lectures	03Hrs/week		CT – 1	15
Tutorials	-		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Use BI systems and technology to support decision making.
2.	Design and build BI applications based on user's needs.
3.	Identify business and technical requirements for a BI solution.

	Course Contents	Hours
Unit 1	**Business Intelligence:** Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence	**(08)**
Unit 2	**Knowledge Delivery:** The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization	**(06)**
Unit 3	**Efficiency:** Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis	**(06)**
Unit 4	**Mathematical models for decision making:** Structure of mathematical models, Development of a model, Classes of models, Notes and readings.	**(06)**
Unit 5	**M-Commerce** : Introduction to m-commerce :Emerging applications, different players in m-commerce, m-commerce life cycle Mobile financial services, mobile entertainment services, and proactive service management	**(06)**
Unit 6	**Business Intelligence Applications:** Marketing models – Logistic and Production models – Case studies.	**(08)**

Text Books

1.	Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", 1st edition, Wiley Publications, 2009.
2.	Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", 1stedition, Addison Wesley, 2003.

Reference Books

1.	David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager's Guide", Second Edition, 2012.
2.	Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", 1st edition, McGraw-Hill,2007

Useful Links

1.	https://www.youtube.com/watch?v=-j5J7lXav7Y,BusinessIntelligenceDemonstration,DarwinsHamster
2.	http://www.kdnuggets.com/2014/09/most-viewed-data-mining-talks-videolectures.htmlData Mining, Grant Marshall, K Dnuggest

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	0	0	2	3	2	0	0	0	0	0	3	2	1	0
CO 2	2	3	1	0	3	0	3	3	2	0	3	2	1	2	0
CO 3	0	3	0	3	0	0	3	2	3	0	0	0	0	1	1

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	-	10
Understand	4	4	2	10
Apply	5	5	3	20
Analyse	-	-	2	-
Evaluate	3	3	-	20
Create	-	-	3	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Second Year (Sem – III) M. C. A.

MC2344 : (Elective-II) Digital Forensics

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
			CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Understand concepts and comprehension of digital forensic as a profession.
2.	Apply the technical tools and techniques used in the field of digital forensics to evaluate an emerging issue in computer and cyber forensics.
3.	Analyse the position or arguments around the issue, and present his/her knowledge in a written logical professional manner.

	Course Contents	Hours
Unit 1	**Introduction of Cyber Crime:** Types, The Internet spawns crime, Computers' roles in crimes, Prevention of Cybercrimes, A global Perspective on cybercrimes, **Digital Forensics:** Historical Background of Digital Forensics, Importance of Digital Forensics, Digital Forensics Rules, Digital Forensics Investigation, DF Investigation Processes/Models/Framework.	**(04)**
Unit 2	**Digital Evidences:** Digital Evidences and its rules, Digital Evidence Characteristics, Types, Challenges in Evidence Handling, Volatile Evidences, Evidence Handling Procedures. **Incident Response:** Overview of Incident Response, People involved in Incident Response Process, Incident Response Methodology, Activities in Initial Response, Phase after detection of an incident.	**(08)**
Unit 3	**Data Collection:** Introduction to Data Collection, People Involved in Data Collection Techniques, Live Data Collection, Data Collection from Windows, Unix. **Forensic Duplication:** Forensic Duplication Rules, Need of Forensic Duplication, Forensic Duplicates as Admissible Evidence, Important Terms, Forensic Duplication Tools, Creating a Forensic Duplicate of a Hard Drive,	**(08)**
Unit 4	**Network Forensics:** Introduction to Intrusion Detection System, Types of Intrusion Detection System, Advantages and Disadvantages of IDS, Understanding Network Intrusions and Attacks, Recognizing Pre-Intrusion/Attack Activities, Port Scans, Address Spoofing, Attacking with Trojans, Viruses and Worms, Kerberos, Collecting Network-Based Evidence. **Email Forensics, Mobile Phone Forensics, Cloud Forensics** Digital Forensics Tools.	**(08)**
Unit 5	**Data Analysis:** Data Analysis Techniques, Forensic Analysis of File Systems **Report Writing:** Goals of Report, Investigative Report Layout, Guidelines for Report Writing.	**(04)**
Unit 6	**Cyber Law:** Introduction to Cyber Laws, Why do we need Cyber law: The Indian Context, Three Bodies of Law, Types, Levels, Computers Related Laws, Cybercrime and the Indian ITA 2000 and amendments, Honeypots, The Indian Penal Code (IPC) 1860, Mapping of Cybercrime with IT Act, Technology and Students: Indian Scenario	**(08)**

Text Books

1.	Digital Forensic: The Fascinating World of Digital Evidences by Dr.Nilakshi Jain, Dr.Dhananjay R. Kalbande, Wiley 2016, ISBN: 978-8126565740
2.	Digital Forensics with Open Source Tools by Cory Altheide and Harlan Carvey, Syngress, April 2011, ISBN: 978-1597495868

Reference Books

1.	Digital Evidence and Computer Crime: Forensic Science, Computers and the Internet by Eoghan Casey, Academic Press; 3rd edition ISBN: 978-0123742681
2.	Computer Forensics: Investigating Data and Image Files by EC-Council Press, Cengage Learning; 1 edition ISBN: 978-1435483514
3.	Guide to Computer Forensics and Investigations by Bill Nelson, Amelia Phillips, Christopher Steuart, Cengage; 5 edition (January 15, 2015), ISBN: 978-1285060033
4.	Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis and Presentationby Lee Reiber, McGraw-Hill Education (16 December 2015), ISBN: 978-0071843638
5.	Digital Forensics with Kali Linux by Shiva V.N. Parasram, Packt Publishing Limited (19 December 2017), ISBN-13: 978-1788625005

Useful Links			
1.	Indian Computer Emergency Response Team https://www.cert-in.org.in/		
2.	CDAC, Cyber Security and Cyber Forensics, https://www.cdac.in/index.aspx?id=cyber_security		
3.	Maharashtra Judicial Academy and Indian Mediation Centre and Training Institute http://mja.gov.in/Site/Home/Index.aspx		
4.	Secure India- A Group of Cyber Security Specialists http://www.secureindia.in/		
5.	Resource Centre for Cyber Forensics – India http://www.cyberforensics.in		
6.	Cyber Law of India http://www.cyberlawsindia.net		
7.	International Forensic Sciences Education Dept. (Forensic Sciences and Investigation Courses) http://www.ifs.edu.inhttp://www.forensic.co.in/		
8.	Computer Forensic Training Centre Online http://www.cftco.com/		
9.	Digital Forensic Magazine http://www.digitalforensicsmagazine.com/		
10.	The Journal of Digital Forensics, Security and Law https://commons.erau.edu/jdfsl/		
11.	Journal of Digital Forensic Practice https://www.tandfonline.com/loi/udfp20		
12.	Electronic Crime Scene Investigation: A Guide for First Responders - https://www.ncjrs.gov/		
13.	CERIAS Forensics Research (http://www.cerias.purdue.edu/research/forensics/) Scientific Working Group on Digital Evidence (https://www.swgde.org/)		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	2	1	1	2	0	2	3	0	2	0	2	3	1	2
CO 2	2	2	3	2	2	0	3	1	0	0	0	1	1	3	1
CO 3	2	2	3	2	2	0	3	1	0	1	0	3	2	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand	02	02	02	10
Apply	05	05	03	20
Analyse	04	04	03	20
Evaluate	04	04	02	10
Create				
TOTAL	15	15	10	60

Government College of Engineering, Karad

Second Year (Sem – III) M. C. A.

MC2315 : (Elective III) Data Mining

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
			CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Describe the designing of Data Warehousing so that it can be able to solve the root level problems.
2.	Understand various tools of Data Mining and their techniques to solve the real time problems.
3.	Develop ability to design various algorithms based on data mining tools and design of new Data Mining techniques.

	Course Contents	Hours
Unit 1	**Introduction:** Classification, cluster analysis, outlier analysis, regression for predictive analysis, data mining applications.	**(06)**
Unit 2	**Data Pre-processing** Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.	**(08)**
Unit 3	**Data Warehousing and Online Analytical Processing:** Data Warehouse: Basic Concepts, Modeling: Data warehouse architecture, Data Cube and OLAP, Design and Usage, portioning strategies, data marting.	**(08)**
Unit 4	**Association:** Basic concepts, frequent item sets mining methods-Apriori algorithm, FP tree.	**(04)**
Unit 5	**Classification:** Basic Concepts, Decision Tree Induction, ID3, C4.5, SLIQ algorithms, Bayes' Classification Methods, Rule-Based Classification.	**(06)**
Unit 6	**Cluster Analysis and Outlier Detection:** Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering. Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches.	**(08)**

Text Books

1.	Data mining - Concepts & Techniques, Jiawei Han, Micheline Kamber, Jian Pei,3rd Ed.2012, MK publications.
2.	Data Warehousing in the Real World-Sam Anahory, Dennis Murray, 3rd Ed. 2008, Pearson Education.

Reference Books

1.	Mastering Data Mining- Michael J. A. Berry, Gordon S. Linoff, 2nd Edition Wiley publications.
2.	Fundamentals of Database Systems, Navathe and Elmasry, Addison Wesley, 2000
3.	Oracle 8i Data Warehousing, Michale Corey, Michale Abbey, Tata McGraw Hill

Useful Links

1.	http://nptel.ac.in/courses/106106093/35Data Mining, Shrinath Shrinivasa IIT Madras
2.	http://www.kdnuggets.com/2014/09/most-viewed-data-mining-talks-videolectures.html Data Mining, Grant Marshall, Kdnuggest

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	0	0	1	1	1	0	1	0	1	1	0	1	1	0	1
CO 2	2	0	2	0	1	0	1	1	1	1	0	1	2	2	1
CO 3	0	2	3	2	2	0	1	2	1	0	3	2	1	1	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	5	10
Understand	3	5	2	10
Apply	5	2	3	20
Analyse	2	-	-	-
Evaluate	-	3	2	20
Create	-	-	3	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Second Year (Sem – III) M. C. A.

MC2325: (Elective III) Cloud Computing

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
			CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Distinguish between different types of architectures and services in the cloud Computing.
2.	Understand the management in cloud computing.
3.	Analyze different security issues and challenges in cloud computing.

	Course Contents	Hours
Unit 1	**Basics of Cloud Computing:** Overview, Applications, Intranets and the Cloud. Your Organization and Cloud Computing- Benefits, Limitations, Security Concerns. Software as a Service (SaaS)- Understanding the Multitenant Nature Of SaaS Solutions, Understanding SOA. Platform as a Service (PaaS)-IT Evolution Leading to the Cloud, Benefits of PAAS Solutions, Disadvantages of PaaS Solutions. Infrastructure as a Service (IaaS)-Understanding IaaS, Improving Performance through Load Balancing, System and Storage Redundancy, Utilizing Cloud-Based NAS Devices, Advantages, and Server Types.	**(08)**
Unit 2	**Data Storage and Security in Cloud:** Cloud file systems: GFS and HDFS, Big Table, HBase and Dynamo Cloud data stores: Data store and Simple DB, Cloud Storage-Overview, Cloud Storage Providers. Securing the Cloud- General Security Advantages of Cloud-Based Solutions, Introducing Business Continuity and Disaster Recovery. Disaster Recovery- Understanding the Threats.	**(08)**
Unit 3	**Virtualization:** Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Types of Hypervisors, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Centre Automation. Common Standards: The Open Cloud Consortium, Open Virtualization Format, Standards for Application Developers: Browsers (Ajax), Data (XML, JSON), Solution Stacks (LAMP and LAPP), Syndication (Atom, Atom Publishing Protocol, and RSS), Standards for Security.	**(06)**
Unit 4	**Cloud Service Providers:** Amazon Web Services-Elastic Compute Cloud (EC2), Simple Storage Service (S3), Simple Queue Service (SQS), Elastic Block Storage (EBS), Elastic Load Balancing (ELB), Simple DB, Relational Database Service (RDS), Virtual Amazon Cloud, Google- AppEngine, Google Storage, Windows Azure, Rackspace Cloud	**(06)**
Unit 5	**Cloud Applications:** Business and Consumer Applications- CRM & ERP, Productivity, Social Networking, Media Applications, Multiplayer Online Gaming, E-Commerce Applications, , Cloud for e-Governance, Scientific Applications- Healthcare, Biology, Geoscience etc.	**(06)**
Unit 6	**Future of Cloud Computing:** How the Cloud Will Change Operating Systems, Location-Aware Applications, Intelligent Fabrics, Paints, and More, The Future of Cloud TV, Future of Cloud-Based Smart Devices, Faster Time to Market for Software Applications, Home-Based Cloud Computing, Mobile Cloud, Autonomic Cloud Engine, Multimedia Cloud, Energy Aware Cloud Computing, Jungle Computing, micro services, Future Research Directions and Challenges in Cloud Computing, Case Studies.	**(06)**

Text Books

1.	Dr. Kris Jamsa, " Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more" , Wiley Publications, ISBN: 978-0-470-97389-9
2.	Cloud Computing: Principles and Paradims, Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley Publication, 1st Edition
3.	Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, McGraw Hill Publication, 1st Edition
4.	Gautam Shrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, Cambridge University Press, ISBN: 9780511778476

Reference Books	
1.	Cloud Computing Insight into New-Era Infrastructure, Dr. Kumar Saurabh, Wiley India Pvt. Ltd., 1st Edition
2.	Cloud Computing- V. K. Pachghare, PHI Learning, New Delhi, ISBN No. 978-81-203-5213-1, Jan 2016
3.	Cloud Computing: A Practical Approach, Anthony T. Velte, Tata McGraw Hill, 2009
4.	Guide to Cloud Computing: Principals and Practices, Richard Hill, Laurie Hirsch, Peter Lake, Siavash Moshiri, Springer, 1st Edition
5.	Enterprise Cloud Computing, Gautam Shroff, Cambridge, 1st Edition
6.	Cloud Security and Privacy, Tim Mather, Subra K, Shahid L.,Oreilly, 1st Edition
Useful Links	
1.	http://nptel.ac.in/courses/106106129/28
2.	https://cloudacademy.com/courses/
3.	https://www.lynda.com/Cloud-Computing-training-tutorials/1385-0.html
4.	http://scpd.stanford.edu/search/publicCourseSearchDetails.do?method=load&courseId=11815

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	2	2	1	0	2	0	0	0	0	2	2	1	1
CO 2	2	1	1	2	1	0	1	0	0	1	0	1	1	0	0
CO 3	3	2	3	2	3	0	2	0	0	0	0	0	1	2	2

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand	02	02	02	10
Apply	05	05	03	20
Analyse	04	04	03	20
Evaluate	04	04	02	10
TOTAL	15	15	10	60

Government College of Engineering, Karad

Second Year (Sem – III) M.C.A.

MC2335 : (Elective III) Big Data Analytics

Teaching Scheme			Examination Scheme	
Lectures	03Hrs/week		CT – 1	15
			CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Understand the Big Data challenges.
2.	Gain conceptual understanding of NOSQL Database, map and reduce and functional programming
3.	Apply concepts of Hadoop Distributed File System.

	Course Contents	Hours
Unit 1	**"Big Data" in the Enterprise** Big Data Concepts, Challenges. Opportunities from Big Data Enterprise Information Management :New Approach to Enterprise Information Management For Big Data, Capabilities needed for Big data **Big Data Implications for Industries** Big Data Analytics for Telecom/Banking/Retail/HealthCare/IT/Operations	**(8)**
Unit 2	**Data Modelling Approaches for Big data And Analytics Solution** Understanding data integration Pattern Big Data Workload Design Approaches Map-Reduce patterns, Algorithms and Use Cases	**(5)**
Unit 3	**NOSQL Data Modelling Technique** Introduction of NoSQL Database concepts: ACID Vs. BASE, Advantages, Where Applicable, Schema, Two Phase Commit, Sharding and Share Nothing Architecture, NoSQL Databases, Brewers CAP Theorem, Features and comparisons of few NOSQL Databases (Cassandra, MongoDB, Cloudera, CouchDB, HBase)	**(7)**
Unit 4	**Hadoop Framework** Hadoop Architecture, History of Hadoop – Facebook, Dynamo, Yahoo, Google Components Of Hadoop Framework :HDFS, MAP Reduce Introduction to Pig, Hive, Mahout Installation of Single Node cluster- installation of Java, Hadoop Configuration	**(8)**
Unit 5	**Big Data Analytics Methodology** Big data Analytics Methodology- Analyse& Evaluate Business Cases Develop Business Hypothesis-Analyse outcomes, Build & Prepare Data sets, Select & Build Analytical Model, Design For Big data Scale, Build production ready System, Setting up the Big Data Analytics System, Gathering data, Measure & Monitor	**(7)**
Unit 6	**Extracting Value From Big Data** Real time Analytics, Apache Spark, In-Memory Data Grid for Real time Analysis , Map Reduce & Real Time Processing ,Use Case	**(5)**

Reference Books

1.	Madhu Jagadeesh, Soumendra Mohanty, Harsha Srivatsa, "Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics", 1st Edition, A press (2013)
2.	Frank J. Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley Publishers (2012)
3.	Cristian Molaro, Surekha Parekh, Terry Purcell, "DB2 11: The Database for Big Data &Analytics",MC Press, (2013)
4.	Tom White, "Hadoop –The Definitive Guide, Storage and analysis at internet scale",SPD,O'Really
5.	DT Editorial Services, "Big Data, Black Book-Covers Hadoop2, MapReduce, Hive, YARN, Pig, R and Data Visualization" Dreamtech Press, (2015).

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	3	0	0	0	0	0	0	0	0	0	2	0	1
CO 2	2	1	0	0	2	0	1	0	0	3	0	0	0	1	1
CO 3	2	0	3	0	3	0	0	0	0	0	0	0	0	2	0

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand	02	02	02	10
Apply	05	05	03	20
Analyse	04	04	03	20
Evaluate	04	04	02	10
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Second Year (Sem – III) M. C. A.				
MC2345: (Elective III) Advanced Software Engineering				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		CT – 1	15
			CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO)

Student should able to

1.	Understand the advantages of various (Agile) Software Development Lifecycle Models over traditional method.
2.	Apply knowledge on today's working model of Agile and learn different type of terminology / Planning methods and Agile ceremony.
3.	Understand Agile in details – Role and responsibility and different Agile methodologies.

	Course Contents	Hours
Unit 1	**INTRODUCTION – Traditional SDLC methodology** Software engineering concepts – Development activities – Software lifecycle models - Classical waterfall - Iterative waterfall –Software project management – Project planning – Estimation – Scheduling – Risk management – Software configuration management.	**(04)**
Unit 2	**Agile – Today's working model** What is Agile? - Manifesto for Agile – 12 Principles of Agile – Team Size – Team Skill – Life Cycle – Different type of delivery Iterative and Incremental	**(08)**
Unit 3	**Feature/ Story/ Task/ Impediments/ Estimation / Dependency/ Risk/ SoS** What is Feature – Story – Task - Different Estimation methods (planning Poker/ T-Shirt) – PI Planning (Part 1)/ Agile Ceremonies (Introduction)/ Project Backlog/ Sprint Backlog/	**(08)**
Unit 4	**Agile – Scrum – Working Model** Team size / skill (review) – Define Project work – High level view – External stakeholders (PO/ Architecture/ Project Director/ RTE) – Role of each team member (Scrum Master/ PO (BA)/ Developer) -	**(08)**
Unit 5	Agile Ceremonies (PI planning/ Sprint Planning/ Daily Scrum Meeting/ Demo/ Retrospective) – Spill over- Mini project Model (Planning and ceremony) – Tracking performance –	**(08)**
Unit 6	**Advance Agile** Different Type of Agile (Scrum/ Kanban/ XP) – DevOps – SAFe	**(04)**

Text Books/ Reference link

1.	Scrum Primer" - a short, readable and concrete introduction to the Scrum Framework by Pete Deemer, Gabrielle Benefied, Craig Larman, and Bas Vodde (http://www.scrumprimer.org/)
2.	"Scrum Reference Card" by Michael James (http://scrumreferencecard.com/)
3.	"7 Obstacles to Enterprise Agility" by Michael James (http://scrumreferencecard.com/7-obstacles-to-enterpriseagility/)
4.	"Scrum in a Nutshell" (http://media.agile42.com/content/Scrum_in_a_nutshell.pdf)
5.	"Scrum Cheat Sheet" (https://www.protechtraining.com/pdf/ScrumCheatSheet.pdf)
6.	"The Scrum Guide" (http://scrumguides.org/)

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	3	2	1	1	0	0	0	0	0	1	2	2	0	1
CO 2	2	2	2	2	0	0	0	0	0	0	2	3	1	2	2
CO 3	1	2	3	1	1	0	0	0	0	0	1	2	1	2	1

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand	02	02	02	10
Apply	05	05	03	20
Analyse	04	04	03	20
Evaluate	04	04	02	10
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Second Year (Sem – III) M. C. A.				
MC2306: Data Science Lab				
Teaching Scheme			**Examination Scheme**	
Practical	02 Hrs/week		CA	50
Total Credits	01			

Course Outcomes (CO)	
Student should able to	
1.	Understand Data Science for and the skillset needed to be a Data Scientist
2.	Evaluate different tools for Data Science and create effective visualization of given data.
3.	Apply basic machine learning algorithms for predictive modelling.

	Course Contents	
Experiment 1	Data Science Overview	
Experiment 2	Statistical Analysis and Business Applications	
Experiment 3	Python/R Environment Setup and Essentials	
Experiment 4	Mathematical Computing with Python/R	
Experiment 5	Scientific computing with Python/R	
Experiment 6	Data Manipulation with Pandas/R	
Experiment 7	Machine Learning with Scikit–Learn/CARET	
Experiment 8	Natural Language Processing with Scikit-Learn/EDA	
Experiment 9	Data Visualization in Python/R	
Experiment 10	Web Scraping with Python/R	
Experiment 11	Python/R integration with Hadoop MapReduce and Spark	
List of Submission:		
	Minimum 10 experiments to be performed and evaluated Journal	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	3	2	3	1	1	0	1	2	0	2	3	2	1	2
CO 2	2	1	2	2	2	1	0	2	2	0	2	2	3	2	3
CO 3	2	2	3	2	2	2	0	2	2	1	2	2	1	1	2

Government College of Engineering, Karad				
Second Year (Sem – III) M.C.A				
MC2307:Mobile Technologies Lab				
Teaching Scheme			**Examination Scheme**	
Practical	02Hrs/week		CA	25
			ESE	25
Total Credits	01			

Course Outcomes (CO)

Student should able to

1.	Apply essential Android Programming concepts.
2.	Develop various Android applications related to layouts & rich uses interactive interfaces
3.	Evaluate and explore Mobile security issues.

	Course Contents	
Experiment 1	Installing "Android Studio IDE" and "Android SDK"	
Experiment 2	Create an application that designs a layout with a text box and button named Submit. The user should enter the text in the text box. When the submit button is clicked then the text in the text box should be displayed in the toast.	
Experiment 3	Create sample application with login module. (Check username and password) On successful login, go to next screen. And on failing login, alert user using Toast. Also pass username to next screen.	
Experiment 4	Create an application to call specific entered number by user in the Edit Text	
Experiment 5	Create an application that will show List of Countries in One fragment , and on selecting one country, second fragment should be displayed with name selected country and its flag.	
Experiment 6	Understanding of UI: a. Create an UI such that, one fragment of screen have list of all the types of cars. b. On selecting of any car name, second fragment of screen should show Car details Like: name, launched date, company name, images (using gallery) if available, show different colors in which it is available.	
Experiment 7	Create an Android Program to Perform all Operations using Calculators	
Experiment 8	Android Program to Demonstrate Layouts in an Activity and Nesting of Layouts and Demonstrate List View Activity	
Experiment 9	Create an application that will play a media file from the memory card.	
Experiment 10	Create an application to send message between two emulators.	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	1	1	1	0	0	0	0	0	0	2	1	3
CO 2	3	2	2	2	3	0	0	0	1	1	1	2	1	2	3
CO 3	2	3	3	2	3	0	0	0	1	0	2	1	2	1	3

Government College of Engineering, Karad

Second Year (Sem – III) M.C.A

MC2308: Internet of Things Lab

Teaching Scheme			Examination Scheme	
Practical	02Hrs/week		CA	50
Tutorials	01Hr/week			
Total Credits	03			

Course Outcomes (CO)

Student should able to

1.	Explain the usage of the term "The Internet of Things" in different contexts.
2.	Understand where the IOT concept fits within the broader ICT industry and possible future trends.
3.	Appreciate the role of big data cloud computing and data analytics in a typical IOT system.

Course Contents

Unit 1	**Introduction to the Internet of Things:** What is the IOT and why is it important? Elements of an IoT ecosystem. Technology drivers, Business drivers, Typical IOT applications, Trends and implications,
Unit 2	**Sensors and sensor nodes:** Sensing devices, Sensor modules, nodes and systems
Unit 3	**Connectivity and networks:** Wireless technologies for the IOT, Edge connectivity and protocols. Wireless sensor networks.
Unit 4	**Analytics and applications:** Signal processing, real-time and local analytics, Databases, cloud analytics and applications.
Unit 5	**Implementation of IOT** Implementation of IoT with Raspberry Pi4
Unit 6	**IOT lab exercises and mini-project:** Local processing on the sensor nodes, Connecting devices at the edge and to the cloud, Processing data offline and in the cloud, Mini-project: Designing an IoT system (a group exercise. where, 2 members/group).

Tutorials

A set of Tutorial/ problems based on above syllabus is to be submitted

Sample List of Experiments:

Experiment 1	Connect R PI to input output devices.
Experiment 2	Installation of Raspbian on R Pi SD Card.
Experiment 3	Interfacing LED on Raspberry GPIO and use timer.
Experiment 4	Interfacing LED on Raspberry GPIO and use timer.
Experiment 5	Interfacing IR sensor on Raspberry GPIO.
Experiment 6	Interfacing motor drive on Raspberry GPIO.
Experiment 7	Installation and configuration of web server.
Experiment 8	Interfacing RELAY circuit on R Pi.
Experiment 9	Interfacing LED on Raspberry GPIO and use timer.
Experiment 10	Installation of vnc server on R Pi.

List of Submission:

Total number of Experiments: 10

Text Books

1. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", 1st edition, O'Reilly Media,2016
2. Cuno Pfister, Getting Started with the Internet of Things, 1st edition O'RELLY Media,2011

Reference Books

1. Charles Bell, "Beginning Sensor Networks with Arduino and Raspberry", 1stedition, A press, 2013.
2. EbenUpton,TheRaspberryPiUserGuide,2nd edition,Wiley,2013

Useful Links

1. https://www.youtube.com/watch?v=9ZUFYyXhQm8, Introduction to Internet of Things, Knoesis Center
2. Introduction to Internet of Things: Course homepage: http://www.knoesis.org/cs4800-6800-sp...Dr.Alexandru

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	2	1	1	1	1	0	1	2	0	2	3	2	1	2
CO 2	3	2	2	2	3	0	0	2	2	0	2	2	3	2	3
CO 3	2	3	3	2	3	0	0	2	2	1	2	2	1	1	2

Government College of Engineering, Karad				
Second Year (Sem – III) M. C. A.				
MC2309: Software Development Project Lab				
Teaching Scheme			**Examination Scheme**	
Practical	04 Hrs/week		CA	50
Tutorial	02 Hrs/week		ESE	50
Total Credits	04			

Course Outcomes (CO)	
Student should able to	
1.	Demonstrate knowledge of the distinction between critical and noncritical systems.
2.	Demonstrate the ability to manage a project including planning, scheduling and risk assessment/management.
3.	Demonstrate proficiency in rapid software development techniques.

Nature of Project		
	The project batches of 2-3 students should be formed, which will work on the project allocated by the department. The batch must complete it during first semester only. Term work submission should be done in the form of a joint report. The term work assessment will be done jointly by teachers appointed by Head of the Institution. The oral examination will be conducted by an internal and external examiner as appointed by the University.	
1	Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.	
2	Two mid-term evaluations should be done, which includes presentations and demos of the work done.	
Project Report Format:	Project report should be of 15 to 20 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed.	
	1. Page Size: Trimmed A4 **2. Top Margin:** 1.00 Inch **3. Bottom Margin:** 1.32 Inches **4. Left Margin:** 1.5 Inches **5. Right Margin:** 1.0 Inch **6. Para Text:** Times New Roman 12 Point Font **7. Line Spacing:** 1.5 Lines **8. Page Numbers:** Right Aligned at Footer. Font 12 Point. Times New Roman **9. Headings:** Times New Roman, 14 Point Bold Face **10. Certificate:** All students should attach standard format of Certificate as described by the department. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/ Director. **11. Index of Report:** **a.** Title Sheet **b.** Certificate **c.** Acknowledgement **d.** Table of Contents **e.** List of Figures **f.** List of Tables **12. References:** References should have the following format For Books: “Title of Book”, Authors, Publisher, Edition For Papers: “Title of Paper”, Authors, Journal/Conference Details, Year	
Useful Links:		
1	http://www.geeksforgeeks.org/	
2	https://in.udacity.com/	
3	https://graphics.stanford.edu/~seander/bithacks.html	
4	https://www.youtube.com/results?search_query=mycodeschool	
5	https://www.hackerrank.com/	
Tutorials:		
	Eight tutorials based on project is to be submitted.	

Mapping of COs and POs

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CO 1	2	3	3	3	0	0	0	0	0	0	0	1	3	1	2
CO 2	3	2	3	1	3	0	3	0	0	3	3	2	3	2	3
CO 3	3	1	3	2	0	0	2	2	0	2	3	3	3	1	3

Government College of Engineering, Karad				
Second Year (Sem – III) M. C. A.				
MC2310: SWAYAM/MOOC COURSE				
Teaching Scheme			**Examination Scheme**	
Contact Hours	-		CA	-
			ESE	-
Total Credits	1			

Course Outcomes (CO)	
Student should able to	
1.	Explore the new technology of their interests.
2.	Evaluate the technical and practical knowledge required in industries.
3.	Implement the knowledge learnt from this course in real time projects.

Nature of Project		
	The student should choose any one of the SWAYAM/MOOC course of their choice from the knowledge domains mentioned below. It is necessary that every student should take prior permission of the course to be chosen from the DBoS.	
1	Credits earned by the students in the respective course are transferred to the credit 1 as per the departmental policy for this course.	
Useful Links:		
1	http://www.geeksforgeeks.org/	
2	https://in.udacity.com/	
3	https://graphics.stanford.edu/~seander/bithacks.html	
4	https://www.youtube.com/results?search_query=mycodeschool	
5	https://www.hackerrank.com/	
Knowledge Domains	1. Technical Courses 2. Management Courses 3. Soft Skills	

Mapping of COs and POs

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CO 2	3	1	0	2	3	0	0	0	0	0	3	3	3	2	3
CO 3	2	2	1	1	3	0	0	0	0	0	3	3	3	1	3

Government College of Engineering, Karad

Second Year (Sem – III) M. C. A.

MC2311: Professional Communications

Laboratory Scheme			Examination Scheme	
Practical	04 Hrs/week		CA	25
			ESE	25
Total Credits	02			

Course Outcomes (CO)

Student should able to

1.	Practice professional skills to communicate effectively & confidently.
2.	Develope advanced language skills to face the campus interviews with good confidence.
3.	Build awareness to face the real time challenges in the corporate world.

	Course Contents	Hours
Unit 1	**LSRW-I** Module-I: Listening Module-II:Speaking Module-III:Reading Module-IV:Writing	**(06)**
Unit 2	**Advance Grammer/Verbal Ability** Module-I: Sentence Completion,Sentence Improvement Module-II: Parajumbles Module-III: Reading Comprehension Module-IV: Cloze Test	**(06)**
Unit 3	**Interview Preparation** Module-I: Resume Writing Module-II: Interview Techniques Module-III: Mock Interview	**(06)**
Unit 4	**Personality Development** Module-I: Goal Setting Module-II: Attitude Building Module-III: Personality & Its Traits Module-IV: Building effective digital profile	**(06)**
Unit 5	**Presentation Skill** Module-I: Mock GD Module-II: Grooming & Etiquettes Module-III: Presentation Techniques	**(06)**
Unit 6	**Logical Reasoning** Module-I:Clocks & Calenders Module-II: Syllogism Module-III: Series & Pattern Completion **Quantitative Aptitude** Module-I: Permutation & Combination Module-II: Probability Module-III: Geometry & Mensuration	**(10)**

Tutorials			
	A set of Tutorial/ problems based on above syllabus is to be submitted		

Mapping of COs and POs

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CO 2	3	1	0	2	3	0	0	0	0	0	3	3	3	2	3
CO 3	2	2	1	1	3	0	0	0	0	0	3	3	3	1	3

Government College of Engineering, Karad

Second Year (Sem – IV) M. C. A.

MC2401: Industrial Project

Teaching Scheme			Examination Scheme	
Contact Hours	20 Hrs/week		CA	100
			ESE	100
Total Credits	10			

Course Outcomes (CO)

Student should able to

1.	Demonstrate knowledge of the distinction between critical and noncritical systems.
2.	Demonstrate the ability to manage a project including planning, scheduling and risk assessment/management.
3.	Demonstrate proficiency in rapid software development techniques.

Nature of Project

	The project work to be carried out individually commences in the Semester VI as per the project assigned to the each individual by the respective industry.It shall include the problem definition, literature survey, approaches for handling the problem, finalizing the methodology for the project work and system design etc. Term work submission should be done in the form of anindividual report. The term work assessment will be done jointly by teachers appointed by Head of the Department. The oral examination will be conducted by an internal and external examiner as appointed by the Institute.	
1	Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.	
2	Two mid-term evaluations should be done, which includes presentations and demos of the work done.	
Project Report Format:	Project report should be of 15 to 20 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed.	
	1. Page Size: Trimmed A4 **2. Top Margin:** 1.00 Inch **3. Bottom Margin:** 1.32 Inches **4. Left Margin:** 1.5 Inches **5. Right Margin:** 1.0 Inch **6. Para Text:** Times New Roman 12 Point Font **7. Line Spacing:** 1.5 Lines **8. Page Numbers:** Right Aligned at Footer. Font 12 Point. Times New Roman **9. Headings:** Times New Roman, 14 Point Bold Face **10. Certificate:** All students should attach standard format of Certificate as described by the department. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/ Director. **11. Index of Report:** **a.** Title Sheet **b.** Certificate **c.** Acknowledgement **d.** Table of Contents **e.** List of Figures **f.** List of Tables **12. References:** References should have the following format For Books: “Title of Book”, Authors, Publisher, Edition For Papers: “Title of Paper”, Authors, Journal/Conference Details, Year	
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CO 1	0	0	0	0	1	0	0	0	0	1	0	0	1	1	2
CO 2	2	1	2	2	1	0	2	0	2	0	3	1	2	2	1
CO 3	2	0	2	1	2	0	1	0	3	1	2	2	2	1	1

Government College of Engineering, Karad				
Second Year (Sem – IV) M. C. A.				
MC2402: Seminar				
Teaching Scheme			**Examination Scheme**	
Contact Hours	4 Hrs/week		CA	50
Total Credits	2			
Course Outcomes (CO)				
Student should able to				
1.	To develop and support a relevant and informed thesis, or point of view, that is appropriate for its audience, purpose, discipline, and theme.			
2.	To demonstrate effective writing skills and processes by employing the rhetorical techniques of academic writing, including invention, research, critical analysis and evaluation, and revision.			
3.	To incorporate and document appropriate sources in accordance with the formatting style proper for the discipline and effectively utilize the conventions of standard written English.			
Nature of Seminar				
	The aim of this seminar is to make the students to study regarding industrial project. They are expected to go through the latest trend pertaining to computer and allied fields, to do the literature survey and deliver the seminar on their work done in an industrial project. The other important aim of the seminar is to encourage and develop the personality, aptitude and knowledge of the students.			
1	Seminar work should be continually evaluated based on the contributions of an individual student, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.			
2	Two mid-term evaluations should be done, which includes presentations and demos of the work done.			
Project Report Format:	Seminar report should be of 15 to 20 pages (typed on A4 size sheets). For standardization of the seminar reports the following format should be strictly followed.			
	1. Page Size: Trimmed A4 **2. Top Margin:** 1.00 Inch **3. Bottom Margin:** 1.32 Inches **4. Left Margin:** 1.5 Inches **5. Right Margin:** 1.0 Inch **6. Para Text:** Times New Roman 12 Point Font **7. Line Spacing:** 1.5 Lines **8. Page Numbers:** Right Aligned at Footer. Font 12 Point. Times New Roman **9. Headings:** Times New Roman, 14 Point Bold Face **10. Certificate:** All students should attach standard format of Certificate as described by the department. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/ Director. **11. Index of Report:** **a.** Title Sheet **b.** Certificate **c.** Acknowledgement **d.** Table of Contents **e.** List of Figures **f.** List of Tables **12. References:** References should have the following format For Books: “Title of Book”, Authors, Publisher, Edition For Papers: “Title of Paper”, Authors, Journal/Conference Details, Year			
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CO 2	0	0	2	1	1	0	0	1	3	2	1	1	0	2	3
CO 3	0	0	1	1	1	0	0	2	3	3	1	2	1	1	3

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	10
Understand	-	-	-	10
Apply	-	-	-	10
Analyse	-	-	-	10
Evaluate	-	-	-	10
Create	-	-	-	-
TOTAL				50