



SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)

UG Programmes CE, CSE, ECE, EEE, IT & ME are Accredited by NBA, Accredited by NAAC with A+

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

Estd:1980

Regulation: R20		IV / IV - B.Tech. I - Semester							
COMPUTER SCIENCE ENGINEERING									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2020-21 admitted Batch onwards)									
Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20HS4101	Universal Human Values-2: Understanding Harmony	HS	3	3	0	0	30	70	100
#PE-III	Professional Elective -III	PE	3	3	0	0	30	70	100
#PE-IV	Professional Elective -IV	PE	3	3	0	0	30	70	100
#PE-V	Professional Elective -V	PE	3	3	0	0	30	70	100
#OE-III	Open Elective-III	OE	3	3	0	0	30	70	100
#OE-IV	Open Elective-IV	OE	3	3	0	0	30	70	100
#SOC-V	Skill Oriented Course - V	SOC	2	1	0	2	--	50	50
B20CS4116	Industrial/Research Internship 2 Months	PR	3	--	--	--	--	50	50
TOTAL			23	19	0	2	180	520	700

	Course Code	Course
#PE-III	B20CS4101	Cloud Computing
	B20CS4102	Neural Networks and Soft Computing
	B20CS4103	Ad-hoc and Sensor Networks
	B20CS4104	Cyber Security & Forensics
#PE-IV	B20CS4105	Deep Learning Techniques,
	B20CS4106	Social Networks & Semantic Web,
	B20CS4107	Computer Vision,
	B20CS4108	MOOCS-NPTEL/SWAYAM)
#PE-V	B20CS4109	Block Chain Technologies
	B20CS4110	Wireless Network Security,
	B20CS4111	Internet of Things
	B20CS4112	MOOCS-NPTEL/SWAYAM)
#SOC-V	B20CS4113	PYTHON: Deep Learning
	B20CS4114	Mean Stack Technologies-Module II- Angular JS, MongoDB
	B20CS4115	Internet of Things Lab
	B20CS4116	APSSDC offered Courses
#OE-III & #OE-IV	Student has to study one Open Elective each from OE-III & IV offered by CE or ECE or EEE or ME or S&H from the list enclosed.	

Code	Category	L	T	P	C	I.M	E.M	Exam
B20HS4101	HS	3	--	--	3	30	70	3 Hrs.

UNIVERSAL HUMAN VALUES-2: UNDERSTANDING HARMONY

(Common to AIDS, CSBS, CSE, IT & ME)

Course Objectives:

1.	To enable students appreciate the essential complementarity between 'Values' and 'Skills' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2.	To understand the harmony in the human being, family, society and nature/existence
3.	To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.

Course Outcomes: At the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1.	Identify the importance of human values and skills for sustained happiness	K2
2.	Understand how to balance profession and personal happiness/ goals.	K2
3.	Express their commitment towards what they have understood (human values, human relationship and human society)	K2
4.	Explain the significance of trust, mutually satisfying human behavior and enriching interaction with nature.	K2
5.	Develop/ propose appropriate technologies and management patterns to create harmony in professional and personal life.	K3

SYLLABUS

UNIT-I (10 Hrs)	Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
UNIT-II (08 Hrs)	Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material 'Body' Understanding the needs of Self ('I') and 'Body' - happiness and physical facility Page 29 of 43 Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

	Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail; Programs to ensure Sanyam and Health.
UNIT-III (08 Hrs)	Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship Understanding the meaning of Trust; Difference between intention and competence Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
UNIT-IV (08 Hrs)	Understanding Harmony in the Nature and Existence - Whole existence as Coexistence Understanding the harmony in the Nature Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self regulation in nature Understanding Existence as Co-existence of mutually interacting units in all pervasive space Holistic perception of harmony at all levels of existence.
UNIT-V (08 Hrs)	Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
Textbooks:	
1.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
Reference Books:	
1.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3.	The Story of Stuff (Book).
4.	The Story of My Experiments with Truth
5.	Small is Beautiful E. F Schumacher by Mohandas Karamchand Gandhi
6.	Slow is Beautiful Cecile Andrews

7.	Economy of Permanence J C Kumarappa
8.	Bharat Mein Angreji Raj Pandit Sunderlal
9.	Rediscovering India by Dharampal Hind Swaraj or Indian Home
10.	Rule by Mohandas K. Gandhi
11.	India Wins Freedom Vivekananda Maulana Abdul Kalam Azad 12Romain Rolland (English)



Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4101	PE	3	--	--	3	30	70	3 Hrs.

CLOUD COMPUTING

(For CSE)

Course Objectives:

1	Fundamentals of Cloud Computing, Concepts of Virtualization and the Cloud delivery and Deployment Models.
2	To introduce the various levels of services that can be achieved by cloud.
3	To motivate students to do programming and experiment with the various cloud computing environments.
4	Common types of persistent storage devices, Cloud computing software security objectives, design principles and development practices.
5	To motivate students to do programming and experiment with the various cloud computing environments.

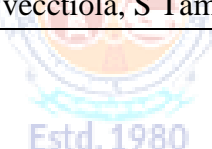
Course Outcomes: At the end of the course, students will be able to

S. No	OUT COME	Knowledge Level
1	Summarize the main concepts for state-of-the-art cloud computing, Identify the architecture and infrastructure of cloud computing, including cloud delivery and Deployment models.	K2
2	Determine a Cloud Enabling Technologies of various levels of architectures.	K3
3	Apply Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud.	K4
4	Identify the type's storage system architectures; analyze the core issues of cloud computing such as security, privacy, and interoperability.	K4
5	Integrate cloud applications development in various environments.	K3

SYLLABUS

UNIT-I (10 Hrs)	Introduction to Cloud Computing , Meaning of Cloud and History, Evolution of Cloud Computing, Cloud essential Characteristics, Cloud Computing Architecture: Cloud Service Models/Types (i.e., Public, Private, Hybrid, and Community), Cloud deployment models (i.e., IaaS, PaaS, SaaS, and PaaS), System models for Distributed and Cloud Computing, Service Oriented Architecture, Performance, Security and Energy Efficiency
UNIT-II (10 Hrs)	Cloud Enabling Technologies: Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.
UNIT-III (10 Hrs)	Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized

	Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.
UNIT-IV (10 Hrs)	Storage Systems: Evolution of storage technology, storage models, File systems and database, distributed file systems, general parallel file systems. Google file system. Cloud Computing Software Security Fundamentals: Cloud Information Security Objectives, Confidentiality, Integrity, Availability, Cloud Security Services, Secure Cloud Software Requirements.
UNIT-V (10 Hrs)	Cloud Technologies and Advancements: Hadoop: MapReduce, Programming on Amazon AWS and Microsoft Azure, Google App Engine and Programming Environment for Google App Engine, Federation in the Cloud: Four Levels of Federation Federated Services and Applications, Future of Federation.
TEXTBOOK:	
1.	Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2.	Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
REFERENCE BOOKS:	
1.	Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madiseti, University Press
2.	Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
3.	Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH



ANNA
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Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4102	PE	3	--	--	3	30	70	3 Hrs.

NEURAL NETWORKS AND SOFT COMPUTING

(For CSE)

Course Objectives:

1	To introduce the foundations of Artificial Neural Networks.
2	To acquire the knowledge on Soft Computing Concepts.
3	To learn various types of Genetic algorithms and its applications.
4	To gain knowledge to apply optimization strategies.

Course Outcomes: At the end of the course, students will be able to

S. No	OUTCOME	Knowledge Level
1	Understand the concepts of Artificial intelligence and soft computing techniques	K2
2	Analyze the concepts of Neural Networks and select the Learning Networks in modeling real world systems.	K4
3	Implement the concepts of Fuzzy reasoning and concepts of Genetic algorithm and its applications to soft computing.	K3
4	Classify Biologically inspired algorithm such as neural networks, genetic algorithms, ant colony optimization, and bee colony optimization.	K3
5	Design hybrid system incorporating neural network, genetic algorithms, fuzzy systems.	K4

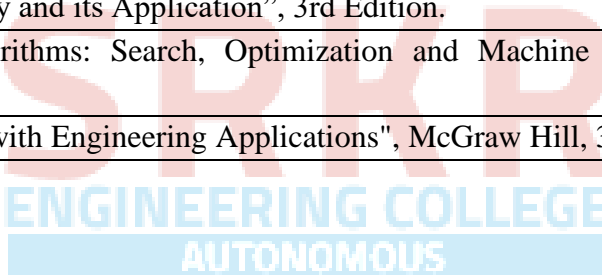
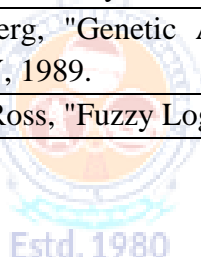
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AUTONOMOUS

SYLLABUS

UNIT-I (06 Hrs)	Soft Computing and Artificial Intelligence: Introduction of Soft Computing, Soft Computing vs. Hard Computing, Various Types of Soft Computing Techniques, Applications of Soft Computing, AI Search Algorithm, Predicate Calculus, Rules of Inference, Semantic Networks, Frames, Objects, Hybrid Models.
UNIT-II (09 Hrs)	Artificial Neural Networks and Paradigms: Introduction to Neuron Model, Neural Network Architecture, Learning Rules, Perceptrons, Single Layer Perceptrons, Multilayer Perceptrons, Back propagation Networks, Kohonen's self-organizing networks, Hopfield network, Applications of NN.
UNIT-III (12 Hrs)	Fuzzy Logic: Introduction, Fuzzy sets and Fuzzy reasoning, Basic functions on fuzzy sets, relations, rule based models and linguistic variables, fuzzy controls, Fuzzy decision making, applications of fuzzy logic.

UNIT-IV (12 Hrs)	Genetic Algorithms and Swarm Optimizations: Introduction, Genetic Algorithm, Fitness Computations, Cross Over, Mutation, Evolutionary Programming, Classifier Systems, Genetic Programming Parse Trees, Variants of GA, Applications, Ant Colony Optimization, Particle Swarm Optimization, Artificial Bee Colony Optimization.
UNIT-V (09 Hrs)	Hybrid Systems: Neuro fuzzy hybrid systems, Adaptive neuro fuzzy inference systems, Fuzzy backpropagation network, Genetic neuro hybrid system, Genetic algorithm based backpropagation network, Genetic-fuzzy hybrid systems
TEXTBOOKS:	
1.	Simon S. Haykin, Neural Networks, Prentice Hall, 2nd edition.
2	S. Rajasekaran & G. A. Vijayalakshmi Pai “Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications”, PHI,2003
REFERENCE BOOKS:	
1.	S. N. Sivanandam & S. N. Deepa ”Principles of Soft Computing” Wiley – India, 2nd Edition, 2007. 2. 3.
2.	Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall, 1998.
3.	Jacek M. Zurada, Introduction to Artificial Neural Systems, Jaico Publishing House,1994
4.	Zimmermann, “Fuzzy Set Theory and its Application”, 3rd Edition.
5.	D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.
6.	Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 3rd edition 2009.



Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4103	PE	3	--	--	3	30	70	3 Hrs.

AD-HOC AND SENSOR NETWORKS

(For CSE)

Course Objectives:

1	Architect sensor networks for various application setups.
2	Identify the Issues in designing a MAC Protocol and its Classification.
3	Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers.
4	Evaluate the performance of sensor networks and identify bottlenecks.

Course Outcomes: At the end of the course, students will be able to

S. No	OUTCOME	Knowledge Level
1	Apply the principles and characteristics of mobile ad hoc networks (MANETs) and distinguishes them from infrastructure-based networks.	K3
2	Apply the principles and characteristics of wireless sensor networks.	K3
3	Understand the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks.	K2
4	Illustrate the various sensor network Platforms, tools and applications.	K2
5	Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs.	K3

SYLLABUS

UNIT-I (09 Hrs)	Introduction to Ad Hoc Wireless Networks Introduction to Wireless Networks, Difference between Cellular and AdHoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Technical and Challenges of MANETs, Issues in MANETs.
UNIT-II (09 Hrs)	Routing Protocols for Ad Hoc Wireless Networks Issues in designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Topology-based versus Position-based Approaches. Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks.
UNIT-III (09 Hrs)	Security protocols for Ad hoc Wireless Networks Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Management, Secure Routing in Ad hoc Wireless Networks, Intrusion Detection Systems.

UNIT-IV (09Hrs)	Basics of Wireless Sensors and Applications The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications of WSN, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.
UNIT-V (09 Hrs)	Security in Wireless Sensor Networks (WSNs) Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote. Sensor Network Operating Systems – TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, Dataflow Style Language-TinyGALS. Node-Level Simulators - NS-2 and its extension to sensor networks, TOSSIM
TEXTBOOK:	
1.	Ad Hoc Wireless Networks – Architectures and Protocols, 1st edition, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004.
2.	Ad Hoc Mobile Wireless Networks: Principles, Protocols and Applications - Subir Kumar Sarkar, T.G. Basavaraju and C. Puttamadappa, CRC PressTaylor & Francis Group – 2013.
REFERENCE BOOKS:	
1.	Wireless Sensor Networks: An Information Processing Approach, 1st edition, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005. rp2009.
2.	Wireless Sensor Networks-Technology, Protocols, and Applications, Kazem Sohraby, Daniel Minoli, & Taieb Znati John Wiley, 2007.
3.	Wireless Sensor Network Designs - Anna Hac, John Wiley, 2003.
4.	Ad Hoc and Sensor Networks – Theory and Applications, 2nd edition Carlos Corderio Dharma P. Aggarwal, World Scientific Publications / Cambridge University Press, March 2006.

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4104	PE	3	--	--	3	30	70	3 Hrs.

CYBER SECURITY & FORENSICS

(For CSE)

Course Objectives:

- | | |
|---|---|
| 1 | Identify security risks and take preventive steps |
| 2 | Understand the forensics fundamentals |
| 3 | Understand the evidence capturing process |
| 4 | Understand the preservation of digital evidence |

Course Outcomes: At the end of the course, students will be able to

S. No	OUTCOME	Knowledge Level
1	Understand the Concepts of Cybercrime Fundamentals	K2
2	Describe the various cyber-attacks that can be made against a network.	K2
3	Analyze various tools available for Cybercrime Investigation	K4
4	Demonstrate the fundamental principles and tools of computer forensics and investigation.	K3
5	Analyze the legal perspectives of Cybercrime	K4

SYLLABUS

UNIT-I (10 Hrs)	Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.
UNIT-II (08 Hrs)	Tools and Methods: Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer overflow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration
UNIT-III (10 Hrs)	Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.
UNIT-IV (08 Hrs)	Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating

	and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.
UNIT-V (08 Hrs)	Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario
TEXTBOOK:	
1.	Sunit Belapure Nina Godbole “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, WILEY, 2011.
2.	Nelson Phillips and Enfinger Steuart, “Computer Forensics and Investigations”, Cengage Learning New Delhi, 2009.
REFERENCE BOOKS:	
1.	Michael T. Simpson, Kent Backman and James E. Corley, “Hands on Ethical Hacking and Network Defence”, Cengage, 2019.
2.	Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3.	Alfred Basta, Nadine Basta, Mary Brown and Ravinder Kumar “Cyber Security and Cyber Laws” , Cengage, 2018
E-Resources:	
1.	CERT-In Guidelines- http://www.cert-in.org.in/
2.	https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3.	https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]
4.	Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu License: Creative Commons BY-NC-SA

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4105	PE	3	--	--	3	30	70	3 Hrs.

DEEP LEARNING TECHNIQUES

(For CSE)

Course Objectives:

1	Understand and recollect basic concepts of machine learning
2	Understand concepts of deep feed forward network mechanisms
3	Understand and analyze the concepts of CNN, RNN models
4	Study the concepts of auto encoders and optimization techniques
5	Study and analyze the different DNN architectures

Course Outcomes: At the end of the course, students will be able to

S. No	OUTCOME	Knowledge Level
1	Demonstrate the basic concept of Machine learning	K2
2	Apply the concepts of deep feed forward networks.	K3
3	Apply the concepts of CNN & RNN models	K3
4	Explain and apply optimization techniques and auto encoders.	K3
5	understand about different DNN models and apply that knowledge to different applications.	K3

SYLLABUS

UNIT-I (12 Hrs)	Fundamentals Concepts of Machine Learning Historical Trends in Deep Learning-Machine Learning Basics: Learning Algorithms-Supervised and Unsupervised Training, Linear Algebra for machine Learning, Testing, Cross-Validation, Dimensionality reduction, Over/Under-fitting, Hyper parameters and validation sets, Bias, Variance, Regularization
UNIT-II (10 Hrs)	Deep Feed Forward Networks Deep feed forward networks- Introduction, Various Activation Functions, error functions-Regularization for Deep learning-Early Stopping, Drop out.
UNIT-III (10 Hrs)	Convolutional Neural Networks and Sequence Modeling Convolutional Networks: Convolutional operation- Pooling- Normalization, Sequence Modeling: Recurrent Neural Networks, The Long Short-Term Memory.
UNIT-IV (08 Hrs)	Auto Encoders and Optimization Algorithms Auto encoders - Auto encoders: under complete, denoising, optimization for Deep Learning: gradient descent, stochastic gradient descent, mini batch gradient descent, Adagrad, RMSProp, Adam

UNIT-V (10 Hrs)	More Deep Learning Architectures & Applications Alexnet, ResNet, Transfer learning, Deep Generative Models: Boltzmann Machines, Restricted Boltzmann Machines Sentiment Analysis using LSTM, Image Segmentation
TEXTBOOK:	
1.	Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016 (available at http://www.deeplearningbook.org)
2.	Charu C Agarwal, “Neural Networks and Deep Learning”, IBM T. J. Watson Research Center, International Business Machines, Springer, 2018
REFERENCE BOOKS:	
1.	Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
2.	Michael Nielsen, “Neural Networks and Deep Learning”, Online book, 2016 (http://neuralnetworksanddeeplearning.com/)
3.	Li Deng, Dong Yu, “Deep Learning: Methods and Applications”, Foundations and Trends in Signal Processing, 2013.
4.	Christopher and M. Bishop, “Pattern Recognition and Machine Learning”, Springer Science Business Media, 2006.
5.	Jason Brownlee , “Deep Learning with Python” , ebook, 2016
6.	N. D. Lewis, “Deep Learning Step by Step with Python: A Very Gentle Introduction to Deep Neural Networks for Practical Data Science, 2016.
7.	Chris Albon, “Machine Learning with Python Cookbook-practical solutions from preprocessing to Deep learning”, O’REILLY Publisher,2018
E-Reference Links:	
1.	https://medium.com/nybles/create-your-first-image-recognition-classifier-using-cnn-keras-and-tensorflow-backend-6eaab98d14dd
2.	https://www.analyticsvidhya.com/blog/2017/08/10-advanced-deep-learning-architectures-data-scientists/
3.	https://www.geeksforgeeks.org/cross-validation-machine-learning/
4.	https://www.geeksforgeeks.org/activation-functions-neural-networks/
5.	https://towardsdatascience.com/sentiment-analysis-using-lstm-step-by-step-50d074f09948
6.	https://medium.com/@lamiae.hana/a-step-by-step-guide-on-sentiment-analysis-with-rnn-and-lstm-3a293817e314
7.	https://towardsdatascience.com/common-loss-functions-in-machine-learning-46af0ffc4d23
8.	https://d2l.ai/chapter_natural-language-processing-applications/sentiment-analysis-rnn.html

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4106	PE	3	--	--	3	30	70	3 Hrs.

SOCIAL NETWORKS & SEMANTIC WEB

(For CSE)

Course Objectives:

1	To learn Web Intelligence
2	To learn Knowledge Representation for the Semantic Web
3	To learn Ontology Engineering,
4	To learn Semantic Web Applications, Services and Technology
5	To learn Social Network Analysis and semantic web.

Course Outcomes: At the end of the course, students will be able to

S. No	OUTCOME	Knowledge Level
1	Demonstrate social network analysis and measures.	K3
2	Analyze random graph models and navigate social networks data	K4
3	Apply the network topology and Visualization tools.	K3
4	Analyze the experiment with small world models and clustering models.	K4
5	Compare the application driven virtual communities from social network Structure	K3

SYLLABUS

UNIT-I (10 Hrs)	Web Intelligence: Thinking and Intelligent Web Applications, The Information Age ,The World Wide Web, Limitations of Today's Web, The Next Generation Web, Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Software Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.
UNIT-II (08 Hrs)	Knowledge Representation for the Semantic Web: Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Description Framework(RDF) / RDF Schema, Ontology Web Language(OWL), UML, XML/XML Schema.
UNIT-III (10 Hrs)	Ontology Engineering: Ontology Engineering, Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontology Libraries and Ontology Mapping, Logic, Rule and Inference Engines.
UNIT-IV (08 Hrs)	Semantic Web Applications, Services and Technology: Semantic Web applications and services, Semantic Search, e-learning, Semantic Bioinformatics, Knowledge Base ,XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, Web Search Agents and Semantic Methods
UNIT-V (08 Hrs)	Social Network Analysis and semantic web: What is social Networks analysis, development of the social networks analysis, Electronic Sources for Network Analysis – Electronic Discussion

	networks, Blogs and Online Communities, Web Based Networks, Building Semantic Web Applications with social network features.
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TEXTBOOK:

1.	Thinking on the Web – Berners Lee, Godel and Turing, Wiley inter science, 2008.
2.	Social Networks and the Semantic Web, Peter Mika, Springer, 2007.

REFERENCE BOOKS:

1.	Semantic Web Technologies, Trends and Research in Ontology Based Systems, J. Davies, R. Studer, P. Warren, John Wiley & Sons.
2.	Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Francis Group)
3.	Information sharing on the semantic Web – Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
4.	Programming the Semantic Web, T. Segaran, C. Evans, J. Taylor, O’Reilly, SPD



Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4107	PE	3	--	--	3	30	70	3 Hrs.

COMPUTER VISION

(For CSE)

Course Objectives:

1	To introduce students the fundamentals of image formation
2	To introduce students the major ideas, methods, and techniques of computer vision and pattern recognition;
3	To develop an appreciation for various issues in the design of computer vision and object recognition systems;
4	To provide the student with programming experience from implementing computer vision and object recognition applications.

Course Outcomes: At the end of the course, students will be able to

S. No	OUTCOME	Knowledge Level
1	Identify basic concepts, terminology, theories, models and methods in the field of computer vision	K2
2	Describe known principles of feature detection and matching,	K2
3	Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.	K2
4	Design a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths.	K4
5	Understand the basic knowledge, theories and methods of 3D images in computer vision.	K2

SYLLABUS

UNIT-I (10 Hrs)	Introduction: Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighbourhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization.
UNIT-II (08 Hrs)	Feature Detection and Matching: Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature-Based Alignment: 2D and 3D Feature-based Alignment, Pose Estimation, Geometric Intrinsic Calibration.
UNIT-III (10 Hrs)	Structure and Motion: Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion

UNIT-IV (08 Hrs)	Image Stitching: Motion Models, Global Alignment, Composing, Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolution and Blur Removal, image Matting and Compositing, Texture Analysis and Synthesis.
UNIT-V (08 Hrs)	3D Reconstruction: Shape From X, Active Range Finding, Surface Representation, Point based Representation, Volumetric Representation, Model-based Reconstruction, Recovering Texture Maps and Albedos, Image- based Rendering: View Interpolation, Layered Depth Images, Light Fields and Lumigraphs, Environment Mattes, Video-based Rendering.
TEXTBOOK:	
1.	Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011
2.	Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1st Edition, 2012
REFERENCE BOOKS:	
1.	Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2.	Haralick & Shapiro, "Computer and Robot Vision", Vol II
3.	G_erardMedioni and Sing Bing Kang "Emerging topics in computer vision"166
E- Reference:	
1	NPTEL LINK: https://onlinecourses.nptel.ac.in/noc22_ee48/preview



Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4109	PE	3	--	--	3	30	70	3 Hrs.

BLOCK-CHAIN TECHNOLOGIES

(For CSE)

Course Objectives:

- | | |
|---|---|
| 1 | To understand block chain technology and Cryptocurrency works |
|---|---|

Course Outcomes: At the end of the course, students will be able to

S. No	OUTCOME	Knowledge Level
1	Demonstrate the block chain basics, Crypto currency	K2
2	Compare and contrast the use of different private vs. public block chain and use cases	K3
3	Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins	K4
4	Classify Permission Block chain and use cases – Hyper ledger, Corda	K3
5	Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others	K3

SYLLABUS

UNIT-I (10 Hrs)	Introduction: Introduction, basic ideas behind block chain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required, Block chain or distributed trust, Currency, Cryptocurrency, how a Cryptocurrency works, financial services.
UNIT-II (08 Hrs)	Hashing, public key cryptosystems, private vs public block chain and use cases, Hash Puzzles, Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality.
UNIT-III (10 Hrs)	Introduction to Bitcoin: Bitcoin Block chain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc Downside of Bit coin mining, Block chain Science: Grid coin, Folding coin, Block chain Genomics.
UNIT-IV (08 Hrs)	Thorium continued, IOTA, The real need for mining, consensus, Byzantine Generals Problem, and Consensus as a distributed coordination problem, Coming to private or permissioned block chains, Introduction to Hyper ledger, Currency, Token, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency
UNIT-V (08 Hrs)	Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations, Uses of Block chain in E-Governance, Land Registration, Medical Information Systems.

TEXTBOOK:	
1.	Blockchain Blue print for Economy by Melanie Swan
2.	Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.
REFERENCE BOOKS:	
1.	Narayanan, Bonneau, Felten, Miller and Goldfeder, “Bitcoin and Cryptocurrency Technologies- A Comprehensive Introduction”, Princeton University Press.
2.	Imran Bashir, “Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained”, Packt Publishing.
3.	Merunas Grincalaitis, “Mastering Ethereum: Implement Advanced Blockchain Applications Using Ethereum-supported Tools, Services, and Protocols”, Packt
4.	Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, “Blockchain Architecture Design And Use Cases”[MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184/



Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4110	PE	3	--	--	3	30	70	3 Hrs.

WIRELESS NETWORK SECURITY

(For CSE)

Course Objectives:

- | | |
|---|--|
| 1 | To understand the importance of Wireless networks security and its application |
|---|--|

Course Outcomes: At the end of the course, students will be able to

S. No	OUTCOME	Knowledge Level
1	Identify and analyze common wireless security threats and understand how they can be mitigated	K4
2	Understand the basics of cryptography and its application to wireless security, including SSL/TLS and WEP	K2
3	Understand the security features that can be implemented in wireless devices and analyze their effectiveness	K3
4	Evaluate current and future wireless standards and technologies and understand their potential impact on wireless security	K3
5	Design and implement wireless LANs with security considerations for various enterprise and home environments	K4

SYLLABUS

UNIT-I (10 Hrs)	Introduction to Wireless: History of Wireless Technologies, History of Wireless Security, State of the Wireless Security Industry, 2001 Wireless Threats: Uncontrolled Terrain, Communications Jamming, DoS Jamming, Injections and Modifications of Data, Man-in-the-Middle (MITM) Attack, Rogue Client, Rogue Network Access Points, Attacker Equipment,
UNIT-II (08 Hrs)	Introduction to Wireless Security Protocols and Cryptography: Recovery the FUD, OSI Model, OSI Simplified, Internet Model, Wireless LAN Security Protocols, Cryptography, SSL/TLS, Secure Shell Protocols, Terminal Access and File Transfer, Port Forwarding a Word of Caution, Man-in-the-Middle of SSL/TLS and SSH, WTLS, WEP, 802.1x, IP Security
UNIT-III (10 Hrs)	Security Considerations to Wireless Devices: Wireless Device Security Issues, Physical Security, Information Leakage, Device Security Features, Application Security, Detailed Device Analysis, Laptops, Personal Digital Assistants (PDAS), Wireless Infrastructure Wireless Technologies and Applications: Introduction to Cellular Networks- FDMA, TDMA, CDMA, Spread Spectrum Primer, Analogy, TDMA Vs CDMA, PDC, Security Threats
UNIT-IV (08 Hrs)	Introduction to Wireless Data Networks: Cellular Digital Packet Data (CDPD), CDPD Architecture, CDPD Security, Mobitex- Mobitex Architecture, Mobitex Security Architecture,

	Security Issues, Gateway, Security Model Wireless Standards and Technologies: Current and Future Technologies- Infrared, Radio, Spread Spectrum, OFDM, Current and Future Standards- IEEE 802 Standards, ETSI, Home RF, Ultra-wide band Radio (UWB)
UNIT-V (08 Hrs)	Wireless Deployment Strategies: Implementing Wireless LAN's- Security Considerations Common Wireless Network Applications, Enterprise Campus Designs, Wireless IST Design, Retail and Manufacturing Design, Small Office/Home Office Design (SOHO)
TEXTBOOK:	
1.	Wireless Security, Merritt Maxim and David Pollino, Osborne/McGraw Hill, New Delhi, 2005
2.	Wireless Security Models: Threats and Solutions, Nichols and Lekka, Tata McGraw Hill, New Delhi 2006
REFERENCE BOOKS:	
1.	Behrouz A.Forouzan, —Cryptography & Network Securityl, Tata McGraw Hill, India, New Delhi, 2009
2.	William Stallings, —Cryptography and Network Security, Prentice Hall, New Delhi, 2006
3.	Bruce Schneier, “Applied Cryptography”, John Wiley & Sons, New York, 2004



Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4111	PE	3	0	0	3	30	70	3 Hrs.

INTERNET OF THINGS

(For CSE)

Course Objectives: Students are expected to

1. Understand building blocks of IoT and their characteristics
2. Know various architectures and protocols in IoT and security issues
3. Use cloud services for data analytics in IoT applications
4. Develop IoT applications using Arduino programming.

Course Outcomes: At the end of the course, students will be able to

S.No	Outcome	Knowledge Level
1.	Study various Designs of IoT and IoT architectures	K2
2	Illustrate various communication protocols in IoT	K3
3	Use of various sensors and Actuators in IoT applications and Implement IoT applications using Arduino.	K3
4	Analyse data in IoT applications.	K4
5.	Analyse various security issues IoT applications.	K4

SYLLABUS

UNIT-I (10 Hrs)	<p>Introduction to Internet of Things: Definition & Characteristics of IoT, Physical design of IoT-Things in IoT, IoT protocols, Logical Design of IoT- IoT Functional Blocks, IoT Communication Models & API's, IoT levels and deployment templates.</p> <p>IoT Network Architecture and Design: Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture.</p>
UNIT-II (10 Hrs)	<p>Communication Technologies: wired Communication Technologies, wireless Communication Technologies.</p> <p>IoT Access Technologies: PHY/MAC Layer (IEEE 802.15.4), LoRAWAN, RPL.</p> <p>Message Communication Protocols for Connected Devices - CoAP, XMPP, MQTT.</p>
UNIT-III (10 Hrs)	<p>IOT Physical devices and Endpoints: Basic building blocks of an IOT device.</p> <p>Sensors, Participatory sensing, RFIDs: Sensor Technology, Participatory sensing, Industrial IOT and Automotive IOT, Actuator, Radio Frequency Identification technology.</p> <p>Programming with Arduino: Features of Arduino, Components of Arduino board, Arduino IDE, Programming Elements, Case Studies: Traffic control system, DHT Sensor with Arduino.</p>
UNIT-IV (8 Hrs)	<p>Data Acquiring, Organising, Processing and Analytics: Introduction, Data Acquiring and storage, Organising the Data, Transaction, Business Processes, Integration and Enterprise Systems, Analytics, Knowledge Acquiring, Managing and Storing Processes.</p>

UNIT-V (8 Hrs)	IoT Privacy, Security and Vulnerabilities Solutions: Vulnerabilities, Security Requirements and Threat Analysis, IoT Security Tomography and Layered Attacker model, Identity management and establishment, Access control secure message communication, Security models, profiles and protocols for IoT. Case studies illustrating IoT Design: Home Automation, Environment, Agriculture
Text Books:	
1.	Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015.
2.	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things - David Hanes, Gonzalo Salgueiro, Patrick Grossetete Robert Barton, Jerome Henry. 24750 Copyright© 2017 Cisco Systems, Inc. Published by: Cisco Press 800 East 96th Street.
Reference Books:	
1.	Internet of Things: Architecture and Design Principles by Raj Kamal, McGraw Hill Education private limited, 2017.
2.	Getting Started with the Internet of Things CunoPfister, Oreilly.
3.	Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, Reilly (SPD), 2014.
4.	Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
5.	Internet of Things, Jeeva Jose, Khanna Publishing; First edition (2018).
6.	Building Blocks for IoT Analytics Internet-of-Things Analytics, John Soldatos, River Publishers.
e-Resources:	
1.	Introduction to Internet of Things, https://swayam.gov.in/nd1_noc20_cs66/preview
2.	An Introduction to Programming the Internet of Things(IoT) specialization, https://www.coursera.org/specializations/iot

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4113	SOC	1	--	2	2	--	50	3 Hrs.

PYTHON: DEEP LEARNING
(Skill Oriented Course)

Pre-requisites:

- Exploratory data analysis: Collecting, importing, pre-processing, organizing, exploring, analyzing data and deriving insights from data
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012666909428129792728_shared/overview
- Data visualization using Python: Data visualization functions and plots
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051913436938241455_shared/overview
- Regression analysis: Regression, types, linear, polynomial, multiple linear, Generalized linear regression models
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01320408013336576065_shared/overview
- Clustering using Python: Clustering, techniques, Assessment and evaluation
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130441799423426561190_shared/overview
- Machine learning using Python: Machine learning fundamentals, Regression, classification, clustering, introduction to artificial neural networks
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012600400790749184237_shared/overview
- Time series analysis : Patterns, decomposition models, smoothing time, forecasting data
https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0126051804744253441280_shared/overview

Course Objectives Students are expected to learn

1.	Basic concepts fundamental learning techniques and layers
2.	Neural Networks and various random models.
3.	Different optimization algorithms
4.	The hyper parameter tuning
5.	CNN, RNN and auto encoders for transfer learning

Course Outcomes: At the end of the course, students will be able to

S. No	OUT COME	Knowledge Level
1.	Build neural network models for solving various computer vision problems	K4
2.	Develop Recurrent neural network models to solve tasks where the input is sequential data	K4
3.	Construct undercomplete and denoising autoencoders	K4

4.	Apply transfer learning for image classification and for building word embeddings	K3
5.	Apply deep learning techniques and optimisation for solving the real world problems	K3

SYLLABUS

Exercise 1:

Module name : Understanding and Using CNN : Image recognition

Exercise: Design a CNN for Image Recognition which includes hyperparameter tuning.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012785694443167744910_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 2:

Module name : Understanding and Using ANN : Identifying age group of an actor

Exercise : Design Artificial Neural Networks for Identifying and Classifying an actor using Kaggle Dataset.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012776492416663552259_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 3:

Module name : Predicting Sequential Data

Exercise: Implement a Recurrence Neural Network for Predicting Sequential Data.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01279144948849868822_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 4:

Module Name: Removing noise from the images

Exercise: Implement Multi-Layer Perceptron algorithm for Image denoising hyperparameter tuning.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_012792058258817024272_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 5:

Module Name: Optimization of Training in Deep Learning

Exercise Name: Design a Deep learning Network for Robust Bi-Tempered Logistic Loss.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013107917226680320184_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course

Exercise 6:

Module name: Autoencoder for MNIST

Exercise: Demonstration of Application of Autoencoders.

Exercise 7:

Module name: Natural Language Processing

<p>Exercise: Demonstrate word embeddings using word2vec</p> <p>Exercise 8: Module name: Transfer Learning Exercise: Transfer Learning for cat vs dog</p> <p>Exercise 9: Module name : Capstone project Exercise : Complete the requirements given in capstone project Description: In this capstone, learners will apply their deep learning knowledge and expertise to a real world challenge. https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course</p> <p>Exercise 10: Module name : Capstone project Exercise : Complete the requirements given in capstone project https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared?collectionId=lex_auth_01274814254931148859_shared&collectionType=Course</p>

REFERENCE BOOKS:

1.	Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016.
2.	Bishop, C., M., Pattern Recognition and Machine Learning, Springer, 2006.
3.	Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018.

Web Links

1.	https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012782105116811264219_shared/contents [Introduction to Deep Learning]
2.	https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013119291805696000651_shared [Deep learning for Developers]

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4114	SOC	1	--	2	2	--	50	3 Hrs.
MEAN STACK TECHNOLOGIES-MODULE II- ANGULAR JS, MONGODB (Skill Oriented Course)								
Course Objectives:								
1	The core concepts of frontend and dynamic, responsive development for web applications.							
Course Outcomes: At the end of the course, students will be able to								
S. No	OUT COME							Knowledge Level
1	Develop dynamic and responsive web pages using Angular JS							K4
2	Develop web applications with document database using MongoDB							K4
SYLLABUS								
ANGULAR JS: What is Angular, Features of angular, Angular Application Setup, Architecture of Angular, creating components, built-in pipes, Components and Modules, Elements of Template, Structural Directives, Custom Structural Directive, Attribute Directives, Attribute Directive, Data Binding, DOM, Events, Component Life Cycle, Forms, Validation, creating a simple angular application, Executing Angular Application.								
MongoDB: Introduction to MongoDB Structure and Architecture, MongoDB Remote Management, Installing MongoDB on the local computer (Mac or Windows), Introduction to MongoDB Cloud, Create MongoDB Atlas Cluster, GUI tools Overview, Install and Configure MongoDB Compass, Introduction to the MongoDB Shell, MongoDB Shell JavaScript Engine, MongoDB Shell JavaScript Syntax, Introduction to the MongoDB Data Types, Create and Delete Databases and Collections, Introduction to MongoDB Queries.								
REFERENCE BOOKS:								
1.	Pro Mean Stack Development, 1st Edition, ELadElrom, Apress O'Reilly							
2.	MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow, O'Reilly							
3.	Getting MEAN with Mongo, Express, Angular, And Node, Simon Holmes Clive Harber, Manning							
4.	An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda SKatila, Cengage Learning.							
Web Links:								
1.	https://infyspringboard.onwingspan.com/en/app/toc/lex_20858515543254600000_shared/overview (Angular JS)							
2.	https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)							

Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4115	SOC	1	--	2	2	--	50	3 Hrs.
Internet of Things Lab								
(Skill Oriented Course)								
Course Objectives:								
1.	To know how to use various hardware components and Protocols in IoT applications.							
2.	To Know how to develop various IoT applications.							
Course Outcomes:								
S. No	OUT COME							Knowledge Level
1.	Use sensors, actuators, Arduino and Raspberry pi in IoT applications.							K3
2.	Design and Develop various IoT applications.							K6
LIST OF PROGRAMS								
1	To interface Bluetooth with Raspberry Pi/Arduino and write a program to send sensor data to smart phone using Bluetooth.							
2	To interface Bluetooth with Raspberry Pi/Arduino and write a program to to turn ON/OFF LED when '1'/'0' is received from smart phone using Bluetooth.							
3	Application of WiFi in IoT Systems.							
4	App design for WiFi application to ON/OFF Light.							
5	Use of various network protocols in IoT systems.							
6	Application of 802.15.4 Zigbee in IoT Systems.							
7	Design a simple IoT System comprising sensor, Wireless Network connection, Data Analytics.							
8	Design and Interface ESP32 with DC motor using L298 motor driver.							
9	Experiment on connectivity of Rasberry Pi with existing system components.							
Reference Books :								
1	Internet of Things: Architecture, Design Principles and Applications, Rajkamal, McGraw Hill Higher Education. 2017.							
2	Internet of Things - A Hands-on Approach, Arshdeep Bahga and V1"ay Madlsetti, Universities Press, 1st edition, 2014.							
3	Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley, 1st edition, 2014.							
4	Getting Started with the Internet of Things CunoPfister,Oreilly. 2011.							
5	Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, Reilly (SPD),2014.							
e-Resources								
1	Introduction to Internet of Things, https://swayam.gov.in/nd1_noc20_cs66/previe0077 .							
2	An Introduction to Programming the Internet of Things(IoT) specialization, https://www.coursera.org/specializations/iot							



Estd:1980

SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

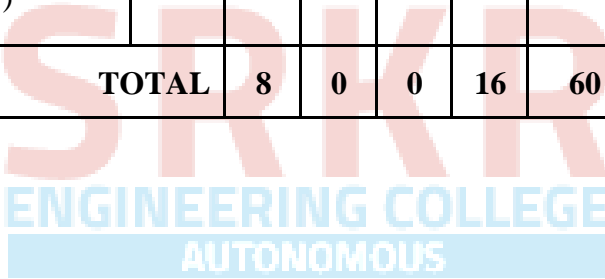
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Regulation: R20		IV / IV - B.Tech. II - Semester							
COMPUTER SCIENCE ENGINEERING									
SCHEME OF INSTRUCTION & EXAMINATION (With effect from 2020-21 admitted Batch onwards)									
Course Code	Course Name	Category	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20CS4201	Project Work (Project work, seminar and internship in industry)	PR	8	0	0	16	60	140	200
TOTAL			8	0	0	16	60	140	200



Estd. 1980



Course Code	Category	L	T	P	C	I.M	E.M	Exam
B20CS4201	PR	--	--	16	8	60	140	3 Hrs.

PROJECT WORK

(For CSE)

Course Objectives:

1	To provide an opportunity to work in group on a topic / problem / experimentation
2	To encourage creative thinking process
3	To provide an opportunity to analyze and discuss the results to draw conclusions
4	To acquire and apply fundamental principles of planning and carrying out the work plan of the project through observations, discussions and decision-making process.

Course Outcomes: At the end of the course the students will be able to

S.No.	Outcome	Knowledge Level
1	Identify a current problem through literature/field/case studies	K3
2	Identify the objectives and methodology for solving the problem	K3
3	Design and Develop technology/process for solving the problem	K4
4	Evaluate the technology/process	K5

*The object of Project Work is to enable the student to take up investigative study in the broad field of Computer Science Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or a group of students, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work.

The assignment to normally include:

- a) Survey and study of published literature on the assigned topic.
- b) Working out a preliminary approach to the problem relating to the assigned topic.
- c) Conducting preliminary Analysis/Modeling/Simulation/Experiment/Design/ Feasibility.
- d) Preparing a written report on the study conducted for presentation to the department.
- e) Final Seminar, as oral Presentation before a departmental committee.