CURRICULUM
FOR THE ACADEMIC YEAR 2022-2023

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M. Tech. (Computer Science & Engineering)

III SEMESTER

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING
(An autonomous college under VTU)
KALABURAGI

About the institution: The Hyderabad Karnataka Education (HKE) society founded by Late Shri. Mahadevappa Rampure, a great visionary and educationist. The HKE Society runs 46 educational institutions. Poojya Doddappa Appa College of Engineering, Gulbarga is the first institution established by the society in 1958. The college is celebrating its golden jubilee year, setting new standards in the field of education and achieving greater heights. The college was started with 50% central assistance and 50% state assistance, and a desire to impart quality technical education to this part of Karnataka State. The initial intake was 120 with degree offered in three branches of engineering viz, Civil, Mechanical and Electrical Engineering. Now, it houses 11 undergraduate courses, 10 post Graduate courses and 12 Research centers, established in Civil Engg., Electronics & Communication Engg, Industrial & Production Engg, Mechanical Engg, Electrical Engg., Ceramic Cement Tech., Information Science & Engg., Instrumentation Technology, Automobile Engg., Computer Sc. and Engg., Mathematics and Chemistry All the courses are affiliated to Visveswaraya Technological University, Belgaum. At present the total intake at UG level is 980 and PG level 193.

The college receives grant in aid funds from state government. A number of projects have been approved by MHRD /AICTE, Govt. of India for modernization of laboratories. KSCST, Govt. of Karnataka is providing financial assistance regularly for the student's projects.

The National Board of Accreditation, New Delhi, has accredited the College in the year 2005-08 for 09 UG Courses out of which 08 courses are accredited for three years and 01 course is accredited for five years. And second time accredited for Six Course in the year 2009-2012

Our college is one among the 14 colleges selected under TEQIP, sponsored by World Bank. It has received a grant of Rs 10.454 Crores under this scheme for its development. The institution is selected for TEQIP phase II in year 2011 for four years. Institution is receiving a grant of Rs. 12.50 Crores under TEQIP Phase -II scheme for its development and selected for TEQIP-III as mentoring Institute for BIET Jhansi(UP).

Recognizing the excellent facilities, faculty, progressive outlook, high academic standards and record performance, the VTU Belgaum reposed abundant confidence in the capabilities of the College and the College was conferred Autonomous Status from the academic year 2007-08, to update its own programme and curriculum, to devise and conduct examinations, and to evaluate student's performance based on a system of continuous assessment. The academic programmers are designed and updated by a Board of Studies at the department level and Academic Council at the college level. These statutory bodies are constituted as per the guidelines of the VTU Belgaum. A separate examination section headed by a Controller of Examinations conducts the examinations.
At present the college has acquired the Academic autonomous status for both PG and UG courses from the academic year 2007-08 and it is one among the six colleges in the state of Karnataka to have autonomous status for both UG and PG courses.

One of the unique features of our college is, it is the first college in Karnataka State to start the Electronics and Communication Engineering branch way back in the year 1967, to join NIT Surathkal and IISc, Bangalore. Also, it is the only college in the state and one among the three colleges across the country, offering a course in Ceramic and Cement Technology. This is the

outcome of understanding by faculty and management about the basic need of this region, keeping in view of the available raw material and existing Cement Industries.

Bharatiya Vidya Bhavan National Award for an Engineering College having Best Overall Performance for the year 2017 by ISTE (Indian Society for Technical Education). In the year 2000, the college was awarded as Best College of the year by KSCST, Bangalore in the state levelstudents projects exhibition.

The college campus is spread over 71 acres of land on either side of Mumbai-Chennai railway track and has a sprawling complex with gardens and greenery all around.

About the department: The Computer Science and Engineering department was started in the year 1984 with an intake of 40 students for UG. The department has seen phenomenal growth and now the department has increased UG intake to 120 students and offering two Post Graduation programmes: PG (Computer Science and Engineering with an intake of 25students) and PG(Computer Network and Engineering with an intake of 18 students). The department is offering research program under its recognized research center. Computer Science and Design course was started from 2021 with an intake of 60 students. The department is having state- of-the-art computing facilities with high speed internet facilities and laboratories. The departmentlibrary provides useful resources like books and journals. The department has well qualified and experienced teaching faculty. The department has been conducting several faculty development programs and student training programs.

Vision of the Institution

To be an institute of excellence in technical education and research to serve the needs of the industry and society at local and global levels.

Mission of the Institution

- To provide a high quality educational experience for students with values and ethics thatenables them to become leaders in their chosen professions.
- To explore, create and develop innovations in engineering and science through research anddevelopment activities.
- To provide beneficial service to the national and multinational industries and communitiesthrough educational, technical, and professional activities

Vision of the Department

- To become a premier department in Computer education, research and to prepare highlycompetent IT professionals to serve industry and society at local and global levels.

Mission of the Department

- To impart high quality professional education to become a leader in Computer Scienceand Engineering.
- To achieve excellence in Research for contributing to the development of the society.
- To inculcate professional and ethical behaviour to serve the industry.

Program Educational Objectives (PEO):

PEO1:	To prepare graduates with core competencies in mathematical and engineering fundamentals to solve and analyze computer science and engineering problems
PEO2:	To adapt to evolving technologies and tools for serving the society
PEO3:	To perform as team leader, effective communicator and socially responsible computer professional in multidisciplinary fields following ethical values
PEO4:	To encourage students to pursue higher studies, engage in research and to become entrepreneurs

Program Outcomes:

01. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

02. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

03. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

04. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

05. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

06. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

07. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

08. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

09. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one„s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

PSO1:	Acquire competency in hardware and software working principles to analyze andsolve computing problems.
PSO2:	Design quality software to develop scientific and business applications followingSoftware Engineering practices.
PSO3:	Apply cutting edge technologies using modern tools to find novel solutions ethicallyto existing problems.

Scheme of Teaching and Examination – 2022-2023
M.Tech. Computer Science & Engineering
Choice Based Credit System (CBCS) & Outcome Based Education System (OBE)

Year: II **Semester: III**

Sl.No	Course	Course Code	Course Title	Teaching Hours per Week			Examination				Credits
				Theory	Practical/ Seminar	Skill Development Activities (Hours are for Inter action between faculty and students)	Duration in hours	CIE Marks	SEE Marks	Total Marks	
				L	P	SDA					
1	PCC	22PCS31	Advanced Data Structures & Algorithm	3	0	2	3	50	50	100	4
2	PEC	22PCS32X	**Professional Elective 3**	3	0	0	3	50	50	100	3
3	OEC	22OPCS33	**Open Elective Courses - 1**	3	0	0	3	50	50	100	3
4	PROJ	22PPCS34	Project Work phase-1	0	6	0	--	100	--	100	3
5	SP	22SPCS35	Societal Project	0	6	0	--	100	--	100	3
6	INT	22IPCS36	Internship	(06 weeks Internship Completed during the Intervening vacation of II and III semesters.)			3	50	50	100	6
			TOTAL	**9**	**12**	**2**	**12**	**400**	**200**	**600**	**22**

Note: PCC: Professional core Courses, PEC: Professional Elective Courses. PROJ- Project Work, INT-Internship, OEC Open Elective Courses, SP- Societal Project

Professional Elective 3	
Course Code under 22PCS32X	**Course title**
22PCS321	Deep Learning
22PCS322	Block Chain & its applications
22PCS323	Robotics and Automation
22PCS324	Network Security

Professional Elective 4 (Open Elective Course)	
Course Code under 22PCS33	**Course title**
22OEPCS33	Machine Learning Using Python

Note:

1. **Project Work Phase-1:** The project work shall be carried out individually. However, in case a disciplinary or interdisciplinary project requires more participants, then a group consisting of not more than three shall be permitted.

Students in consultation with the guide/co-guide (if any)in disciplinary projector guides/co-guides (if any) of all departments in case of multidisciplinary projects, shall pursue a literature survey and complete the preliminary requirements of the selected Project work. Each student shall prepare a relevant introductory project document and present a seminar.

CIE marks shall be awarded by a committee comprising of HOD as Chairman, all Guides and co-guides (if any) and a senior faculty of the concerned departments. The CIE marks awarded for project work phase-1, shall be based on the evaluation of Project Report, Project Presentation skill, and performance in the Question-and-Answers session in the ratio of 50:25:25.

2. **Societal Project:** Students in consultation with the internal guide as well as with external guide (much preferable) shall involve in applying technology to workout/proposing viable solutions for societal problems.

CIE marks shall be awarded by a committee comprising of HOD as Chairman, Guide/co-guide if any, and a senior faculty of the Department. The CIE marks awarded shall be based on the evaluation of Project Report, Project Presentation skill, and performance in the Question and Answer session in the ratio of 50:25:25.

Those, who have not pursued/completed the Societal Project, shall be declared as fail in the course and have to complete the same during subsequent semester/s after satisfying the Societal Project requirements. There is no SEE (University examination) for this course.

3. Internship: Those, who have not pursued/completed the internship, shall be declared as fail in the internship course and have to complete the same during subsequent University examinations after satisfying the internship requirements. Internship SEE (University examination) shall be as per the University norms.

CIE marks shall be awarded by a committee comprising of HOD as Chairman, Guide/co-guide if any, and a senior faculty of the department. The CIE marks awarded for project work phase-1, shall be based on the evaluation of Project Report project Presentation skill, and performance in the Question and Answer session in the ratio of 50:25:25.

Course Title: ADVANCED DATA STRUCTURES & ALGORITHMS		
SubjectCode:**22PCS31**	Credits:4	CIE:50
Number of Lecture Hours/Week	3 Hrs (Theory) +2 Hrs (SDA)	SEE:50
Total Number of Lecture Hours	52	SEE Hours:03

Pre-requisites: Object Oriented Programming Language

Course objectives

- Perform analysis of an algorithms
- Impart concepts of data structures like stacks, queues, list, trees, heaps etc.
- Learn to solve problems using Graph and other algorithm design techniques.

MODULES	**Teaching Hours**
Module– I **Algorithm Analysis:** Mathematical Background, Model, What to Analyze, Running Time Calculations. **List, Stacks and Queues:** Abstract Data Types (ADTs), The List ADT, Vector and List in the STL, Implementation of Vector, Implementation of List, The Stack ADT, The Queue ADT.	**11 Hrs**
Module-II **Trees:** Preliminaries, Binary Trees, The Search Tree ADT–Binary Search Trees. **Hashing:** General Idea, Hash Function, Separate Chaining, Hash Tables Without Linked Lists, Rehashing, Hash Tables in the Standard Library.	**10 Hrs**
Module– III **Priority Queues (Heaps):** Model, Simple Implementation, Binary Heap, Applications of Priority Queues, Priority Queues in the standard Library. **Sorting:** Preliminaries, Insertion Sort, Merge sort, Quick sort.	**10 Hrs**
Module– IV **Graph Algorithms :** Definitions, Topological Sort, Shortest-Path Algorithms, Minimum Spanning Tree, Applications of Depth-First Search approaches.	**10 Hrs**
Module-V **Algorithm Design Techniques:** Greedy Algorithms, Divide and Conquer, Dynamic Programming, Back tracking Algorithms.	**11 Hrs**

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module**.**

TEXT BOOKS:

1. Mark Allen Weiss: Data Structures and Algorithm Analysis in C++,3rd Edition, Pearson,2007.

REFERENCE BOOKS:

1.Yedidyah, Augenstein, Tannenbaum: Data Structures Using C and C++,2ndEdition,Pearson Education,2003.

2.Sartaj Sahni: Data Structures, Algorithms and Applications in C++,2nd Edition, Universities Press

Course outcomes: **On completion of the course, the student will have the ability to:**		
Course Code	**CO#**	**Course Outcome(CO)**
22PCS31	**CO1**	Analyze asymptotic performance of an algorithm and describe List, Stacks and Queues in data structures.
	CO2	Solve problems using trees Hashing.
	CO3	Implement priority queues and demonstrate sorting techniques.
	CO4	Solve problems using graph algorithm and other techniques.
	CO5	Apply various Algorithm Design techniques for problem solving.

Course Title: DEEP LEARNING		
Subject Code:**22PCS321**	Credits:3	CIE:50
Number of Lecture Hours/Week	3 Hrs (Theory)	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03

Pre-requisites: Machine learning , python

Course objectives

- To understand the principles of deep learning and its capabilities and
- To acquire practical skills to design, implement, and train practical deep learning systems.

MODULES	**Teaching Hours**
Module– I Machine Learning Basics: Learning Algorithms, Capacity, Over fitting and Under fitting, Hyper parameters and Validation Sets, Estimator, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Decent, building a Machine Learning Algorithm, Challenges Motivating Deep Learning.	**09 Hrs**
Module-II Deep Feed forward Networks: Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation. Regularization: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging, Dropout.	**08 Hrs**
Module– III Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms. Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates. Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features.	**08 Hrs**
Module– IV Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory.	**08 Hrs**
Module-V Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition. Applications: Vision, NLP, Speech.	**09 Hrs**

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module**.**

TEXTBOOKS:

1. Lan Good fellow and Yoshua Bengio and Aaron Courville Deep Learning MIT Press 2016.

REFERENCEBOOKS:

1. Raúl Rojas Neural Networks: Asystematic Introduction 1996.
2. Chirstopher Bishop Pattern Recognition and machine Learning 2007.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22PCS231	CO1	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
	CO2	Implement deep learning algorithms and solve real-world problems.
	CO3	Execute performance metrics of Deep Learning Techniques.
	CO4	Analyze optimization and generalization techniques of deeplearning for the given problem.
	CO5	Evaluate the given deep learningapplication and enhance by applying latest techniques.

Course Title: **BLOCKCHAIN AND ITS APPLICATIONS**

SubjectCode:**22PCS322**	Credits:3	CIE:50
Number of Lecture Hours/Week	3 Hrs (Theory)	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03

Pre-requisites : Computer Networks; Operating Systems; Cryptography and Network Security.

Course objectives

- Learn about blockchain architecture, the benefits, features and limitations of blockchain
- Different layers of decentralization in the blockchain ecosystem, basic cryptographic primitives.
- Various consensus algorithms, Apply distributed consensus in blockchain
- Components of the Ethereum, components of the Ethereum Virtual Machine (EVM)
- Use the APIs and CLIs of Hyperledger

MODULES	Teaching Hours
Module– I Introduction to Blockchain: The growth of blockchain technology - Progress toward maturity Increasing interest, Distributed systems, the history of blockchain and Bitcoin - The events that led to blockchain , Electronic cash ,Blockchain - Blockchain defined, Blockchain architecture, Generic elements of a blockchain, Benefits, features, and limitations of blockchain, Types of blockchain. Consensus: Consensus mechanism, Types of consensus mechanisms, Consensus in blockchain, CAP theorem and blockchain.	**09 Hrs**
Module-II Decentralization: Decentralization using blockchain, Methods of decentralization - Disintermediation, Contest-driven decentralization, Routes to decentralization - How to decentralize, Decentralization framework example, Blockchain and full ecosystem decentralization - Storage, Communication, Computing power and decentralization, Pertinent terminology- Smart contracts, Autonomous agents, Decentralized organizations, Decentralized autonomous organizations, Decentralized autonomous corporations, Decentralized autonomous societies, Decentralized applications. Cryptographic constructs and blockchain technology: Homomorphic encryption, Signcryption, Secret sharing, Commitment schemes, Zero-knowledge proofs, Different types of digital signatures,Encoding schemes ,Applications of cryptographic hash functions.	**09 Hrs**
Module– III Introducing the consensus problem- The Byzantine generals problem, Fault tolerance, State machine replication, FLP impossibility, Lower bounds on the number of processors to solve consensus, Analysis and design - Model, Processes, Timing assumptions, Classification, Algorithms - CFT algorithms, BFT algorithms, Choosing an algorithm - Finality, Speed, performance, and scalability.	**08 Hrs**
Module– IV Ethereum: An overview, The yellow paper, Ethereum – a user's perspective, The Ethereum network - The mainnet ,Testnets ,Private nets , Components of the Ethereum ecosystem - Keys and addresses ,Accounts , Transactions and messages , Ether cryptocurrency/tokens (ETC and ETH) ,The Ethereum Virtual Machine (EVM) - , Execution environment , The machine state , The iterator function , Smart contracts - Native contracts.	**08 Hrs**
Module-V Hyperledger - Projects under Hyperledger - Distributed ledgers, Libraries ,Tools, Domain-specific, Hyperledger reference architecture - Hyperledger design principles, Hyperledger Fabric - Membership services, Blockchain services, Smart contract services, APIs and CLIs ,Components ,Applications on blockchain, Consensus in Hyperledger Fabric ,The transaction lifecycle in Hyperledger Fabric, Fabric 2.0,	**08 Hrs**

Hyperledger Sawtooth - Core features , Consensus in Sawtooth, Transaction lifecycle , Components.	

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module**.**

TEXT BOOKS:

1. Imran Bashir, "Mastering Blockchain", 3rd Edition, Packt Publishing, 2020

REFERENCE BOOKS:

1. Daniel Drescher, "Blockchain Basics", 1st Edition, Apress, 2017
2. Vikram Dhillon & David Metcalf & Max Hooper, "Blockchain Enabled Applications: Understand the Blockchain Ecosystem and How to Make it Work for You", 1st Edition, Apress, 2017
3. Melanie Swan, "Blockchain: Blueprint for a New Economy", 1st Edition, O′Reilly, 2015.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22PCS322	CO1	Describe the basics of Blockchain.
	CO2	Explain decentralization and cryptographic primitives in block chain.
	CO3	Examine the consensus mechanisms of blockchain.
	CO4	Illustrate blockchain using Ethereum platform.
	CO5	Use the libraries and tools of the Hyperledger blockchain.

Course Title: ROBOTICS AND AUTOMATION		
Subject Code:**22PCS323**	Credits:3	CIE:50
Number of Lecture Hours/Week	**3 Hrs(Theory)**	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
Prerequisite: AI and ML		

Course Objectives

- Learn about automation , types of automation and configuration of robotics
- Describe the concepts of control system , power transmission systems used in robots
- Explain the capabilities of sensors , mobility systems and AI in the field of robotics.

MODULES	**Teaching Hours**
Module–I History of Automation, Reasons for automation, Disadvantages of automation, Automation systems, Types of automation – Fixed, Programmable and Flexible automation, Automation strategies Automated Manufacturing Systems: Components, classification and overview of manufacturing Systems, Flexible Manufacturing Systems (FMS), Types of FMS, Applications and benefits of FMS.	**08 Hrs**
Module–II Definition of Robot, History of robotics, Robotics market and the future prospects, Robot Anatomy, Robot configurations: Polar, Cartesian, cylindrical and Jointed-arm configuration. Robot motions, Joints, Work volume, Robot drive systems, Precision of movement – Spatial resolution, Accuracy, Repeatability, End effectors – Tools and gripper	**08 Hrs**
Module-III Basic Control System concepts and Models, Transfer functions, Block diagrams, characteristic equation, Types of Controllers: on-off, Proportional, Integral, Differential, P-I, P-D, P-I-D controllers. Control system and analysis. Robot actuation and feedback components Position sensors – Potentiometers, resolvers, encoders, velocity sensors. Actuators - Pneumatic and Hydraulic Actuators, Electric Motors, Stepper motors, Servomotors, Power Transmission systems	**09 Hrs**
Module-IV Robot Sensors and Machine vision system Sensors in Robotics - Tactile sensors, Proximity and Range sensors, use of sensors in robotics. Machine Vision System: Introduction to Machine vision, the sensing and digitizing function in Machine vision, Image processing and analysis, Training and Vision systems.	**08 Hrs**
Module-V Robots Technology of the future: Robot Intelligence, Advanced Sensor capabilities, Telepresence and related technologies, Mechanical design features, Mobility, locomotion and navigation, the universal hand, system integration and networking. Artificial Intelligence: Goals of AI research, AI techniques – Knowledge representation, Problem representation and problem solving, LISP programming, AI and Robotics, LISP in the factory.	**09 Hrs**

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Textbook:

1. M.P. Groover Automation, Production Systems and Computer Integrated Manufacturing Pearson Education 2nd Edition, 2007

Reference Books:

1. Fu, Lee and Gonzalez Robotics, control vision and Intelligence McGraw Hill International 2nd Edition, 2007.
2. Klafter, Chmielewski and Negin Robotic Engineering - An Integrated approach Prentice Hall of India 1st Edition, 2009.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22PCS323	**CO1**	Classify various types of automation & manufacturing systems
	CO2	Discuss different robot configurations, motions, drive systems and its performance parameters
	CO3	Describe the basic concepts of control systems, feedback components, actuators and power transmission systems used in robots.
	CO4	Explain the working of transducers, sensors and machine vision systems
	CO5	Discuss the future capabilities of sensors, mobility systems and Artificial Intelligence in the field of robotics.

Course Title: **NETWORK SECURITY**

SubjectCode:**22PCS324**	Credits:3	CIE:50
Number of Lecture Hours/Week	3 Hrs (Theory)	SEE:50
Total Number of Lecture Hours	42	SEE Hours:03

Pre-requisites : Data communication, computer network.

Course objectives

- Understand the network security mechanism and concepts
- Illustrate the concept of transport level security and internet protocol security
- To gain the knowledge of firewall characteristics and configuration

MODULES	**Teaching Hours**
Module– I **Attacks on Computers and Computer Security**: Need for Security, Security Approaches, Principles of Security Types of Attacks.	**08 Hrs**
Module-II **Transport Level Security:** Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS, Secure Shell (SSH).	**09 Hrs**
Module– III **IP Security:** Overview of IP Security (IPSec),IP Security Architecture, Modes of Operation, Security Associations (SA), Authentication Header (AH), Encapsulating Security Payload (ESP), Internet Key Exchange.	**09 Hrs**
Module– IV Intruders, Intrusion Detection. **MALICIOUS SOFTWARE:** Viruses and Related Threats, Virus Counter measures	**08 Hrs**
Module-V **Firewalls:** The Need for firewalls, Firewall Characteristics, Types of Firewalls, Firewall Biasing, Firewall location and configuration	**08 Hrs**

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module, covering all the topics from a module.

The students will have to answer 5 full questions, selecting one full question from each module.

TEXT BOOKS:

1. Cryptography and Network Security Principles and Practice , Pearson Education Inc., William Stallings, Slh Edition, 2014, ISBN: 978-81- 317- 6166-3.

2. Cryptography and Network Security, Atul Kahate, TMH, 2003.

REFERENCE BOOKS:

1. Cryptography and Network Security, Behrouz A. Forouz.an, TMH, 2007.

Course outcomes: **On completion of the course, the student will have the ability to:**		
Course Code	**CO#**	**Course Outcome(CO)**
22PCS324	**CO1**	Explain network security services and mechanisms and explain security concepts
	CO2	Understand the concept of Transport Level Security and Secure Socket Layer.
	CO3	Explain Security concerns in Internet Protocol security
	CO4	Explain Intruders, Intrusion detection and Malicious Software
	CO5	Describe Firewalls, Firewall Characteristics, Biasing and Configuration

Course Title: MACHINE LEARNING USING PYTHON		
SubjectCode:**22OEPCS33**	Credits:3	CIE:50
Number of Lecture Hours/Week	**3 Hrs(Theory)**	SEE:50
Total Number of Lecture Hours	42	SEEHours:03
Prerequisite: Artificial Intelligence		

Course Objectives

- Acquire the knowledge the knowledge of AI
- Learn the python programming
- Data processing and classification

MODULES	**Teaching Hours**
Module–I **Introduction :** Problems Machine Learning Can Solve , Knowing Your Task and Knowing Your Data. **Python Introduction:** Scikit-learn, Installing scikit-learn, Essential Libraries and Tools, Jupyter Notebook, NumPy, SciPy, matplotlib, pandas, mglearn.	**08 Hrs**
Module–II **Supervised Learning :** Classification and Regression, Generalization, Overfitting, and Underfitting, Relation of Model Complexity to Dataset Size, Supervised Machine Learning Algorithms, some Sample Datasets, k-Nearest Neighbors, Linear Models, Naive Bayes Classifiers, Decision Trees, Ensembles of Decision Trees, Kernelized Support Vector Machines, Neural Networks (Deep Learning)	**08 Hrs**
Module-III **Unsupervised Learning and Preprocessing**: Types of Unsupervised Learning, Challenges in Unsupervised Learning, Preprocessing and Scaling: Different Kinds of Preprocessing, Applying Data Transformations, Scaling Training and Test Data the Same Way, The Effect of Preprocessing on Supervised Learning. Dimensionality Reduction, Feature Extraction, and Manifold Learning : Principal Component Analysis (PCA), Non-Negative Matrix Factorization (NMF), Manifold Learning with t-SNE.	**09 Hrs**
Module-IV **Representing Data and Engineering Feature:** Categorical Variables, One-Hot-Encoding (Dummy Variables), Numbers Can Encode Categoricals, One Hot Encoder and Column Transformer: Categorical Variables with scikit-learn, Convenient Column Transformer creation with make_columntransformer, Binning, Discretization, Linear Models, and Trees , interactions and Polynomials, Univariate Nonlinear Transformations, Automatic Feature Selection, Univariate Statistics, Model-Based Feature Selection, Iterative Feature Selection, Utilizing Expert Knowledge.	**08 Hrs**
Module-V **Model Evaluation and Improvement:** Cross-Validation, Cross-Validation in scikit-learn, Benefits of Cross-Validation, Stratified k-Fold Cross-Validation and Other Strategies, Grid Search, Simple Grid Search, The Danger of Overfitting	**09 Hrs**

the Parameters and the Validation Set, Grid Search with Cross-Validation, Evaluation Metrics and Scoring, Keep the End Goal in Mind, Metrics for Binary Classification, Metrics for Multiclass Classification, Regression Metrics, Using Evaluation Metrics in Model Selection.	

Question paper pattern:

The question paper will have ten questions.
There will be 2 questions from each module, covering all the topics from a module.
The students will have to answer 5 full questions, selecting one full question from each module**.**

Textbook:

1. **Introduction to Machine Learning with Python,** by Andreas C. Müller, Sarah Guido, publisher(s): O'Reilly Media, Inc. ISBN: 9781449369897

Reference Books:

1. Python Machine Learning , second Edition , copyright © 2007 Packt Publishing
2. Python Machine Learning , Sebastian Raschka and Vahid Mirjalili, second edition , fully revised.
3. Hands-on Machine learning with Scikit – Learn and Tensor Flow , Aurelien Geron, Copyright © 2017.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22OEPCS33	CO1	Learn the basic of machine learning and python libraries and tools
	CO2	Characterize the machine learning algorithms as supervised learning and unsupervised learning
	CO3	Apply supervised machine learning algorithms to solve real world problems
	CO4	Analyze data representation and automatic features selection
	CO5	Evaluate model using cross-validation , grid search evaluation matrices and scoring

Course Title: **PROJECTPHASE–I**		
SubjectCode:22**PCS34**	Credit:3	CIE:100
Number of Practical Hours/Week/batch	**2 Hrs**	SEE:
		SEE Hours:

Pre-requisite: Knowledge of All Subjects of the Programme

Course Objectives:

- AcquiretheknowledgeofComputerEngineeringandapplythisknowledgetodevelopaProject Model.
- Under standard analyse the Engineering Problem
- Prepare a well organized Documentation for the Project Developed.

Guidelines for Project: • Student has to Identify and formulate problem • Students has to survey 20 to 30 Research Papers of Reputed Publication • Proposed Methodology and Objectives of the Project should be defined • Adopt appropriate method to design selected problem • Timely evaluation of the project will be conducted by concerned guide and Review Committee for CIE assessment. • At the end of the semester students has to prepare and submit a well organized project report.	

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22PCS34	**CO1**	Demonstrate skill to identify and formulate the given problems.
	CO2	Applybasicengineeringknowledgelearntindevelopingsystemindividu allyoringroup
	CO3	Evaluate current research status by conducting literature survey.
	CO4	Design and develop real time applications
	CO5	Apply the programming language for Software Development Life Cycle model for the implementation of the project and prepare well organized report.

Course Title: **INDUSTRIAL INTERNSHIP**		
SubjectCode:**22PCS36**	Credit: 6	CIE:50
Number of Practical Hours/Week/batch	**06 WEEKS**	SEE:50
		SEE Hours:03

Course Objectives:

- Expose Students to the Industry Practices for development of S/W or H/W Product
- Make students to acquire knowledge of cutting edge technology and develop management and communication skills

Guidelines for Internship:

- Student has to choose the Industry and Topic of Internship relevant to their branch of PG course.
- Student has to complete the internship in stipulated period of Time.
- Timely evaluation of the Internship will be conducted by concerned guide and Review Committee for CIE assessment.
- At the end of the semester students has to prepare and submit a well organized Report of Internship.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO#	Course Outcome(CO)
22PCS36	**CO1**	Acquire the knowledge of Industry Practices
	CO2	Learn working on Real time system development
	CO3	Demonstrate management and communication skills
	CO4	Analyse and Test System Performance using standard tools
	CO5	Design well organized documentation of the product design