RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV501- Vehicle Architecture system

Course Objectives:

- To learn the structure of Vehicle , Electric Vehicles, Hybrid Electric Vehicle
- To study about the EV conversion components
- To know about the details and specifications for Electric Vehicles
- To understand the concepts of Plug-in Hybrid Electric Vehicle
- To model and simulate all types of DC motors

Course Outcomes:

After studying this course, students will be able to;

CO1: Summarize the History and Evolution of Vehicles, EVs, Hybrid and Plug-In Hybrid EVs
CO2:Describe the various EV components
CO3: Describe the concepts related in the Plug-In Hybrid Electric Vehicles
CO4: Analyze the details and Specifications for the various EVs developed.
CO5: Describe the hybrid vehicle control strategy.

Syllabus:

Unit 1: Vehicle Mechanics

Vehicle mechanics- Roadway fundamentals, Laws of motion, Vehicle Kinetics, Dynamics of vehicle motion, propulsion power, velocity and acceleration, Tire –Road mechanics, Propulsion System Design.

Unit 2: Vehicle Architecture and Sizing

Electric Vehicle History, and Evolution of Electric Vehicles. Series, Parallel and Series parallel Architecture, Micro and Mild architectures. Mountain Bike - Motorcycle- Electric Cars and Heavy Duty EVs. -Details and Specifications.

Unit 3: Power Components and Brakes

Power train Component sizing- Gears, Clutches, Differential, Transmission and Vehicle Brakes. EV power train sizing, HEV Powertrain sizing, Examples.

Unit 4: Hybrid Vehicle Control Strategy

Vehicle supervisory controller, Mode selection strategy, Modal Control strategies.

Unit 5: Plug-In Hybrid Electric Vehicle

Introduction-History-Comparison with electrical and hybrid electrical vehicle-Construction and working of PHEV-Block diagram and components-Charging mechanisms-Advantages of PHEVs.

REFERENCES:

1. Mehrdad Ehsani, YiminGao, Sebastian E. Gay, Ali Emadi, 'Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design', CRC Press, 2004.
2. Build Your Own Electric Vehicle,Seth Leitman , Bob Brant, McGraw Hill, Third Edition 2013.
3. Advanced Electric Drive Vehicles, Ali Emadi, CRC Press, First edition 2017.
4. The Electric Vehicle Conversion Handbook: How to Convert Cars, Trucks, Motorcycles, and Bicycles -- Includes EV Components, Kits, and Project Vehicles Mark Warner, HP Books, 2011.
5. Heavy-duty Electric Vehicles from Concept to Reality, Shashank Arora, Alireza Tashakori Abkenar, Shantha Gamini Jayasinghe, Kari Tammi, Elsevier Science, 2021
6. Electric Vehicles Modern Technologies and Trends, Nil Patel, Akash Kumar Bhoi, Sanjeevikumar Padmanaban, Jens Bo Holm-Nielsen Springer, 2020
7. Hybrid Electric Vehicles: A Review of Existing Configurations and Thermodynamic Cycles, Rogelio León , Christian Montaleza , José Luis Maldonado , MarCOs Tostado-Véliz and Francisco Jurado, Thermo, 2021, 1, 134–150. https://doi.org/10.3390/thermo10200

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV-502 Dynamics of Automobiles

Course Outcomes:

After studying this course, students will be able to;

CO1: Understand the dynamics of the motor vehicle, modeling and simulation of the dynamic behavior of the vehicle.
CO2: Determine acceleration, tractive effort and reactions for different drives
CO3: Know about the gyroscopic effects and determine stability condition of a vehicle on a curved track and a banked road.
CO4: Design and analyze passive, semi-active, and active suspension using quarter-car, half car, and full car model
CO5: Understand vehicle aerodynamic and dynamic control system

Syllabus:

Module 1: INTRODUCTION

History of road and off road vehicle system dynamics - dynamics of the motor vehicle, coordinate systems- vehicle fixed coordinates system, , details of vehicle systems, wheel angles, typical data of vehicles. Fundamental approaches to vehicle dynamics modeling lumped mass, vehicle fixed coordinate system, motion variables, earth fixed coordinate system, SAE coordinate system, Euler angles ,forces, Newton's second law. Definitions- modeling and simulation of dynamic behavior of vehicle., motion analysis, force analysis, and energy analysis.

Module 2: LONGITUDINAL DYNAMICS

Introduction to longitudinal dynamics - Performance of road vehicles: forces and moments on vehicle, equation of motion, tire forces, rolling resistance, weight distribution, tractive effort/tractive resistance and power available from the engine/ power required for propulsion, road performance curves- acceleration, grade ability, drawbar pull and the problems related to these terms. Calculation of maximum acceleration braking torque, braking force, brake proportioning, braking efficiency, stopping distance, load distribution (three wheeled and four wheeled vehicles), calculation of acceleration, tractive effort and reactions for different drives, Stability of a vehicle on slope, (Problems related to these).

Module 3: LATERAL DYNAMICS

Introduction to lateral dynamics - Steering geometry, types of steering systems, fundamental condition for true rolling, development of lateral forces. slip angle, cornering force, cornering stiffness, pneumatic trail, self aligning torque, power consumed by tire, tire stiffness ,hysteresis effect in tires, steady state handling characteristics. yaw velocity, lateral acceleration, curvature response & directional stability. Stability of a vehicle on a curved track and a banked road. gyroscopic effects, weight transfer during acceleration,

cornering and braking, stability of a rigid vehicle and equations of motion of a rigid vehicle, cross wind handling, the problems related to these terms.

Module 4: VERTICAL DYNAMICS

Introduction to vertical dynamics - Human response to vibrations, classification of vibration, specification and vibration , sources of vibration, suspension systems, Modal Analysis, One DOF, two DOF, free and forced vibration, damped vibration, magnification and transmissibility, vibration absorber, functions of suspension system. body vibrations: bouncing and pitching. doubly conjugate points (only basic idea). body rolling. roll center and roll axis, roll axis and the vehicle under the action of side forces, stability against body rolling. Vehicle dynamics and suspension design for stability, choice of suspension spring rate, chassis springs and theory of chassis springs, gas & and hydraulic dampers and choice of damper, damper characteristics, mechanics of an independent suspension system.. Design and analysis of passive, semi-active, and active suspension using quarter-car, half car, and full car model.

Module 5: VEHICLE AERODYNAMIC AND DYNAMIC CONTROL SYSTEM

Road Loads: Air resistance-Mechanics of air flow around a vehicle, pressure distribution on a vehicle, factors affecting rolling resistance, aerodynamic forces – aerodynamic drag, drag components, drag coefficient, aerodynamic aids, aerodynamic side force, lift force, pitching moment, yawing moment, rolling moment, cross wind sensitivity . Vehicle dynamic Control, modelling of actuators, sensors for automobile control, sensors for detecting vehicle environment, central tyre inflation system. Prediction of vehicle performance. ABS, stability control, traction control.

Text Books

1. Rajesh Rajamani, “Vehicle Dynamics and Control”, 1st edition, Springer, 2005

2. Singiresu S. Rao, “Mechanical Vibrations”, 5th Edition, Prentice Hall, 2010

3. Thomas D. Gillespie, “Fundamentals of Vehicle Dynamics”, Society of Automotive Engineers Inc, 1992

4. Wong. J. Y., “Theory of Ground Vehicles”, 3rd Edition, Wiley-Interscience, 2001 5. N.K. Giri, Automotive Mechanics, Kanna Publishers, 2007

Reference Books

1. Theory of Ground Vehicles - J. Y. Woung - John Willey & Sons, NY

2. Steering, Suspension & Tyres – J. G. Giles, Ilete Books Ltd., London

3. Mechanics of Road Vehicles – W. Steed, Ilete Books Ltd. London

4. Automotive Chassis – P. M. Heldt, Chilton Co. NK 5. Gillespie.T.D., “Fundamental of vehicle dynamic society of Automotive Engineers ",USA, 1992.

6. Vehicle dynamics and control by Rajesh Rajamani , Springer publication

7. Vehicle Dynamics : Theory and Application by Reza N Jazar, Springer publication.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV 503 (a) Electric drives and Motors

Course Outcomes:

After studying this course, students will be able to;

CO1: Understand basic concepts of Electric Drives
CO2: Perform Transient and steady-state analysis in DC Drives

CO3: Know the concepts used in Induction Motor Drives
CO4: Understand fundamentals used in Synchronous Motors Drives
CO5: Compare Switched reluctance motors, Stepper Motors, Permanent Magnet Motor.

Syllabus:

UNIT-I Basic Concepts of Electric Drives Elements of drive systems, Requirement of electric drives, Rating & Selection of drives, groups and individual drives, Constant power and Constant torque drives. Motor Mechanism dynamics Review of Characteristics of AC & DC motors, load characteristic, load-drive speed torque characteristics, quadrant speed torque characteristics. Mechanical Systems Stability of Electric drives, referred moment of inertia and torque of motor load combination, load equalization.

UNIT-II DC Drives Starting & Braking of conventional, Phase controlled and chopper controlled drives, Transient & Steady state analysis, Energy recovery systems.

UNIT-III Induction Motor Drives Conventional method of Starting braking and speed control, PWM, (VSI) Voltage source Inverter and Current Sources (CSI) fed IM drives, cyclo converter fed drive, Vector control drives. Slip Controlled IM Drives Review of Conventional methods & Converter Controlled-Crammers &Scherbius drives; rotor impedance control.

UNIT-IV Synchronous Motors Drives VSI and CSI fed; self-controlled-Brush less &. commutatorless dc & ac motor drives.
UNIT-V Special Drives : Fundamentals of Switched reluctance motors, Stepper Motors, Permanent Magnet Motor Introduction to vector control; Digital control of drives. Case Studies Electric traction, steel & cements plants, textile & paper mills, machine tool drive and CNC, electric cars.

REFERENCE BOOKS

1. Pillai S. K. "A first course on Electrical Drives", Second edition, Wiley Eastern.
2. Ned Mohan Electrical Machine Drive WILEY INDIA

3. Dubey G. K., "Power Semiconductor Controlled Drives", PHI,
4. Dubey G. K. , "Fundamentals of Electrical Drives". Narosa Publishing House.
5. Bose B. K., "Power Electronics and AC Drives", PHI Learning.
6. Murphy M. D., and Tumbuli F., "Power Electronic Control of AC Motors", Pergamon
7. Press, Oxford University Press.
8. P.V. Rao, "Power semiconductor Drives", BS Publications
9. S. Shiva Nagaraju power semiconductor drive PHI learning

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV 503 (b) Sensor Actuators & Control

Course Outcomes:

After studying this course, students will be able to**;**

CO1: Differentiate sensor, transmitter and transducer
CO2: Understand the Principle of operation of inductive & and capacitive transducer
CO3: Know about types, and selection criteria of Actuators
CO4: Compare principle of working of Micro Sensors and Micro Actuators
CO5: Know about the Materials for sensors

Syllabus

UNIT – I SENSORS

Difference between sensor, transmitter and transducer - Primary measuring elements - selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, impedance, backlash, Response time, Dead band. Signal transmission - Types of signal: Pneumatic signal; Hydraulic signal; Electronic Signal. Principle of operation, construction details, characteristics and applications of potentiometer, Proving Rings, Strain Gauges, Resistance thermometer, Thermistor, Hot-wire anemometer, Resistance Hygrometer, Photo-resistive sensor.

UNIT- II INDUCTIVE & CAPACITIVE TRANSDUCER

Inductive transducers: - Principle of operation, construction details, characteristics and applications of LVDT, Induction potentiometer, variable reluctance transducer, synchros, microsyn. Capacitive transducers: - Principle of operation, construction details, characteristics of Capacitive transducers – different types & signal conditioning- Applications:- capacitor microphone, capacitive pressure sensor, proximity sensor.

UNIT III ACTUATORS

Definition, types, and selection of Actuators; linear; rotary; Logical and Continuous Actuators, Pneumatic actuator- Electro-Pneumatic actuator; cylinder, rotary actuators, Mechanical actuating system: Hydraulic actuator - Control valves; Construction, Characteristics and Types, Selection criteria. Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors- Principle of operation and its application: D.C motors - AC motors - Single phase & 3 Phase Induction Motor; Synchronous Motor; Stepper motors - Piezoelectric Actuator.

UNIT IV MICRO SENSORS AND MICRO ACTUATORS

Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors. Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect, other principles.

UNIT V SENSOR MATERIALS AND PROCESSING TECHNIQUES

Materials for sensors: Silicon, Plastics, metals, ceramics, glasses, nano materials Processing techniques: Vacuum deposition, sputtering, chemical vapour deposition, electro plating, photolithography, silicon micro machining, Bulk silicon micro machining, Surface silicon micro machining, LIGA process.

TEXT BOOKS

1. Patranabis.D, “Sensors and Transducers”, Wheeler publisher, 1994.

2. Sergej Fatikow and Ulrich Rembold, “ Microsystem Technology and Microbotics”, First edition, Springer –Verlag NEwyork, Inc, 1997.

3. Jacob Fraden, “Hand Book of Modern Sensors: Physics, Designs and Application” Fourth edition, Springer, 2010.

REFERENCE BOOKS

1. Robert H Bishop, “The Mechatronics Hand Book”, CRC Press, 2002.

2. Thomas. G. Bekwith and Lewis Buck.N, Mechanical Measurements, Oxford and IBH publishing Co. Pvt. Ltd.,

3. Massood Tabib and Azar, “Microactuators Electrical, Magnetic, thermal, optical, mechanical, chemical and smart structures”, First edition, Kluwer academic publishers, Springer, 1997.

4. Manfred Kohl, “Shape Memory Actuators”, first edition, Springer.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV 503 (c) Alternate Automotive Fuels & Emissions

Course Outcomes:

After completion of this course, students will be able to;
1.Know about comparative properties of alternate fuels, CNG, LPG, Alcohol, Vegetable oil and Bio-gas
2. Understand modifications required in SI and CI engines for CNG and LPG Engines
3. Compare the working principle of Hydrogen Cell and Fuel Cell
4. Understand about the Emission formation from SI & CI Engines and its Control
5. Measure Emission using Smokemeter

Syllabus:

UNIT 1: Introduction

Estimate of petroleum reserve, need for alternate fuel, availability and comparative properties of alternate fuels, CNG, LPG, Alcohol, Vegetable oil and Bio-gas

UNIT 2: CNG and LPG

Availability, properties, modifications required in SI and CI engines, performance and emission characteristics, storage, handling and dispensing, and safety aspects. Alcohol - Manufacture of alcohol, properties, blending of Methanol and Ethanol, engine design modifications required and effects of design parameters, performance and emission characteristics, durability. Types of vegetable oils for engine application, esterification, biogas, properties, engine performance and emission characteristics.

UNIT 3: Hydrogen and Fuel cells

Production methods, properties, performance and emission characteristics, storage and handling, safety aspects, Working principle, classification, description of fuel cell systems, fuel cell components, properties of fuel cell, general performance characteristics, emission characteristics, merits and demerits, vehicle design and layout aspects.

UNIT 4: **Emissions from SI & CI Engines and its Control**

Emission formation in S.I. engines – Hydrocarbons – Carbon monoxide – Nitric Oxide, Lead particulates – Polyneculear aromatic hydro carbon emission – Effects of design and operating variables on emission formation in spark ignition engines – Controlling of pollutant formation in engines – Thermal reactors –

Catalytic converters – Charcoal Canister Control for evaporative emission – Positive crank case ventilation system for UBHC emission reduction. Chemical delay – Significance – Intermediate compound formation – Pollutant formation on incomplete combustion – effect of operating variables on pollutant formation – Controlling of emissions – Driving behavior – Fumigation – Exhaust gas recirculation – Air injection – Cetane number effect.

UNIT 5: Emission Measurement and Test procedure

Measurement of CO, CO2, by NDIR. Hydrocarbon by FID – Chemiluminescent detector for NOx measurement, Smoke meters – Dilution tunnel technique for particulate measurement. Procedures on Engine and Chassis Constant Volume Sampling procedures –Emission Test– Sampling probes and valves – Quantifying emissions – Dynamometers

References:

1. Ganesan.V, Internal Combustion Engines, Tata McGraw Hill, 1994.
2. Crouse.W.M, Anglin.A.L., Automotive Emission Control, McGraw Hill 1995.
3. Springer.G.S, Patterson.D.J, Engine Emissions, pollutant formation, Plenum Press, 1986
4. Patterson, D.J, Henin.N.A, Emissions from Combustion engines and their Control, Anna Arbor Science, 1985. Linden.D, Handbook of Batteries and Fuel Cells, McGraw Hill, 1995.
5. Maxwell et al, Alternative Fuel : Emission, Economic and Performance, SAE, 1995
6. Watson, E.B., Alternative fuels for the combustion engine, ASME, 1990
7. Bechtold, R., Alternative fuels guidebook, 1998.
8. Joseph, N., Hydrogen fuel for structure transportation, SAE, 1996.
9. Holt and Danniel, Fuel cell powered vehicles: Automotive technology for the future, SAE, 2001.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV 504 (a) Machine Learning for Automobile Applications

Course Objectives

This course aims to provide the required skill;

1. To introduce the fundamental concepts of machine learning and its applications
2. To learn the classification, clustering and regression based machine learning algorithms
3. To understand the deep learning architectures
4. To understand the methods of solving real life problems using the machine learning techniques
5. To understand the multiple learners, boosting and stacked generalization

Course Outcomes

After completion of this course, students will be able to;

1. Understand the basic concepts of Bayesian theory and normal densities
2. Implement different classification algorithms used in machine learning
3. Implement clustering and component analysis techniques
4. Design and implement deep learning architectures for solving real life problems
5. Combine the evidence from two or more models/methods for designing a system

Syllabus

UNIT I – Bayesian Decision Theory and Normal Distribution: Machine perception - feature extraction - classification, clustering, linear and logistic regression – Types of learning - Bayesian decision theory - classifiers, discriminant functions, and decision surfaces -univariate and multivariate normal densities - Bayesian belief networks.

UNIT II – Classification Algorithms: Perceptron and backpropagation neural network - k-nearest neighbor rule. Support vector machine: multicategory generalizations – Regression Decision trees: classification and regression tree – random forest.

UNIT III – Component Analysis and Clustering Algorithms: Principal component analysis - Linear discriminant analysis - Independent component analysis. K-means clustering - fuzzy k-means clustering – Expectation-maximization algorithm-Gaussian mixture models –auto associative neural network.

UNIT IV – Supervised and Unsupervised: Convolution neural network (CNN) -Layers in CNN - CNN architectures. Recurrent Neural Network -Applications: Speech-to-text conversion-image classification time series prediction.

UNIT V – Combining Multiple Learners: Generating diverse learners - model combination schemes - voting - error-correcting output codes -bagging - boosting - mixture of experts revisited - stacked generalization - fine-tuning an ensemble –cascading

Text Books

1. R. O. Duda, E. Hart, and D.G. Stork, “Pattern Classification”, Second Edition, John Wiley & Sons, Singapore, 2012.
2. Francois Chollet, “ Deep Learning with Python”, Manning Publications, Shelter Island, New York, 2018.

Reference Books

1. Ethem Alpaydin, “Introduction to Machine Learning”, 3rd Edition, MIT Press, 2014.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.
3. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
4. Navin Kumar Manaswi, “Deep Learning with Applications using Python”, A press, New York, 2018.

Content Beyond Syllabus

1,Introduction to Genetic algorithm, Heuristic algorithms: A*, D*, Real-Time A*

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV 504 (b) PROBABILITY AND STATISTICS

Course Objectives

This course aims at providing the required skill;

1. To apply the statistical tools in engineering problems

2.To introduce the basic concepts of probability and random variables

3.To introduce the basic concepts of two dimensional random variables

4.To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems

5.To understand the basic concepts of statistical quality control

Course Outcomes

After completion of this course, students will be able to;

1. Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon

2. Understand the basic concepts of one and two dimensional random variables and apply in engineering applications

3. Apply the concept of testing of hypothesis for small and large samples in real life problems

4. Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control

5. Have the notion of sampling distributions and statistical techniques used in engineering and management problems

UNIT I – Probability And Random Variables: Probability – The axioms of probability –Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II – Two-Dimensional Random Variables: Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III – Testing Of Hypothesis: Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means - Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV – Design Of Experiments: One way and Two-way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial designs.

UNIT V – Statistical Quality Control: Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

Text Books

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

Reference Books

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.

2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.

3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.

4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.

Content Beyond Syllabus

1. Use of Bayes theorem, t -test for the research purposes
2. Practicing hypothesis framing on real time applications

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV 504 (c) Data Analytics

Course Objectives

1. Be exposed to big data

2, Learn the different ways of Data Analysis

3.Be familiar with data streams

4.Learn the mining and clustering

5**.** Be familiar with the visualization

Course Outcomes

After completion of this course, students will be able to;

1.Understand and apply the statistical analysis methods

2. Compare and contrast various soft computing frameworks

3. Design and develop distributed file systems

4, To develop Stream data model

5. Apply Visualization techniques in real time applications

Syllabus

UNIT I – Introduction To Big Data: Introduction to Big Data Platform – Challenges of conventional systems - Web data –Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting - Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.

UNIT II – Data Analysis: Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics - Rule induction - Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

UNIT III – Mining Data Streams: Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window –Real time Analytics Platform(RTAP) applications - case studies - real time sentiment analysis, stock market predictions.

UNIT IV – Frequent Itemset and Clustering: Mining Frequent item sets - Market based model – A priori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent item sets in a stream –Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data –CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

UNIT V – Frameworks and Visualization: MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 – Hadoop Distributed file systems – Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications.

Text Books

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.

2. Anand RajaRaman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

Reference Books

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analystics”, John Wiley & sons, 2012.

2. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O‟ Reilly, 2011.

3. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

Content Beyond Syllabus

Predictive Analytics, linear regression

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV 505 FEM/CFD Lab

List of Experiments (Please Expand it)

1. To study fundamentals of Computational Fluid Dynamics (CFD)
2. To perform CFD analysis of lid driven cavity in Open-Foam
3. To perform CFD analysis of square tube in Open-Foam
4. To perform CFD analysis of a 2D-plate in Open-Foam
5. To perform CFD analysis of bifurcated blood vessel in FEM
6. To study fundamentals of Finite element method and FEA
7. To perform FEM analysis of deep drawing process in FEM
8. To study fundamentals of Sci-Lab
9. To perform matrix operations in Sci-lab
10. To plot 2D & 3D graphs in Sci-lab

References:

1. Versteeg H; An introduction to Computational Fluid Dynamics (The Finite Volume Method);Pearson
2. Jiyuan Tu; Computational Fluid Dynamics: A Practical Approach; Butterworth Heinemann.
3. Gokhale NS; Practical Finite Element Analysis; Finite to Infinite
4. Seshu P; Finite element analysis; PHI.
5. Reddy JN; Introduction to the Finite Element Method; McGraw Hill Inc.
6. Das VV; Programming in Scilab 4.1; New Age International Publishers.
7. Verma A K; Scilab : A Beginner's Approach; Cengage publishers

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV 506 Python Programming in Automobiles Applications

List of Experiments (Please Expand it):

1. To write a Python program to find GCD of two numbers.
2. To write a Python Program to find the square root of a number by Newton's Method.
3. To write a Python program to find the exponentiation of a number.
4. To write a Python Program to find the maximum from a list of numbers.
5. To write a Python Program to perform Linear Search
6. To write a Python Program to perform binary search.
7. To write a Python Program to perform selection sort.
8. To write a Python Program to perform insertion sort.
9. To write a Python Program to perform Merge sort.
10. To write a Python program to find first n prime numbers.
11. To write a Python program to multiply matrices.
12. To write a Python program for command line arguments.
13. To write a Python program to find the most frequent words in a text read from a file.
14. To write a Python program to simulate elliptical orbits in Pygame.
15. To write a Python program to bouncing ball in Pygame.

References:

1. Timothy A. Budd: Exploring python, McGraw-Hill Education.
2. R.Nageshwar Rao ,"Python Programming" ,Wiley India
3. Allen B. Downey; Think Python, O'Reilly Media, Inc.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electric Vehicles, V Semester

EV 508 Minor Project -1

Guidelines:

1.Minor Project-I will be carried out in a group of students (Maximum 03) and team will work under faculty supervisor of relevant field.

2. Students are suggested to select recent topic related to Challenges and advancements in the field of Electric Vehicle Technology for research as a minor project -I.

Evaluation: Continuous Evaluation through Internal Presentation and Viva-voce