Basaveshwar Engineering College (Autonomous), Bagalkot

# Syllabi of Open Electives for 6th semester B. E.

## (offered during Even Semester 2021-22)

| Sub. Code | UAU641N | Subject | Vehicular Systems |
|---|---|---|---|
| Offering Department | Automobile Engineering | Faculty | Prof. P. Nagaraja |

**Brief description of the course:**

This subject broadly covers conventional and contemporary aspects of Automobile Engineering. The detail working principle of engines, clutches and brakes. This includes transmission systems, braking systems and suspension systems etc. The preliminary aspects of global warming, electric vehicles and automotive emissions are also covered.

**Unit I** **10 Hours**

GENERAL: Introduction, electric vehicles, hybrid vehicles, electronics in automobiles; sensors, ECU. Automotive emissions.

VEHICLE LAYOUTS:

Introduction, different types of layouts, front engine front wheel drive, front engine rear wheel drive, rear engine rear wheel drive, four-wheel drive, all-wheel drive.

ENGINES:

Combustion in SI Engines; ignition limits, stages of combustion, detonation, combustion chambers. Combustion in CI Engines; stages of combustion, delay period, diesel knock, combustion chambers.Turbo-charging and dual fuel engines.

**Unit II** **10 Hours**

CONTROL SYSTEMS:

BRAKES: classification, hydraulic brakes, mechanical brakes, disc brakes, drum brakes, brake fluids, requirements, bleeding of brakes, air brakes, vacuum servo brakes, parking brakes, troubleshooting diagnosis. ABS and EBD.

STEERING SYSTEMS: Types of steering systems, correct steering angle, cornering force, under steer and over steer. Types of steering gear; rack and pinion, recirculating type etc. Power steering.

**Unit III** **10 Hours**

TRANSMISSION SYSTEMS:

CLUTCH: Purpose, requirements, materials, types of clutches; single plate, multi-plate, diaphragm, centrifugal, semi-centrifugal, vacuum, hydraulic clutch. Trouble shooting diagnosis. GEAR BOX: Purpose, types of gear box; sliding mesh, constant mesh, synchromesh and epicyclic gear box. Gear box lubrication, gear ox troubles. Automatic transmission; significance and types.

**Unit IV** **10 Hours**

SUSPENSION SYSTEMS:

Purpose, types of springs; coil springs, leaf springs, torsion bar, helper springs, rubber springs. Independent suspension; advantages and types. Shock absorbers. Stabilizer bars. Active suspension. Trouble shooting.

WHEELS AND TYRES:

Wheels; types and materials.

Tyres; Tubed and tubeless tyres; advantages. Tyre materials, desirable tyre properties, aspect ratio, nomenclature, factors affecting tyre life and tyre rotation.

Reference books:


1. Kirpal Singh, Automobile Engineering – Vol. 1 & 2
2. Mathur and Sharma, IC Engines

| Sub. Code | UBT632N | Subject | Environmental Technology |
|---|---|---|---|
| Offering Department | Biotechnology | Faculty | Prof. Madhumala Y |

**Brief description of the course:**

It covers Bio accumulation, Bioremediation, Bioleaching, Biomining, Solid waste management, Waste water treatment, Biofuels

**Unit I** **10 Hours**

**Introduction**

Current Environmental Issues and scope of Environmental science and technology. Biogeochemical role of soil microorganisms. Bioconcrete. Environment Impact Assessment

**Bioaccumulation of toxicants**

Characteristics of Xenobiotics, Relationship of Bioaccumulation with Chemical Structure, Ecophysiology of Bioaccumulation, Process of toxicants uptake, Factors affecting bioaccumulation, measurement of bioaccumulation.

**Sustainable future:** Green building concept, Carbon foot print, crediting, trading and its calculation, Water foot print. Rain water harvesting.

**Unit II** **10 Hours**

**Waste water treatment**

Waste water characteristics BOD, COD, Primary & Secondary treatment,nanofiltration, ultrafilt ration and microfiltration. Microbial removal of phosphorous and Nitrogen.Wastewater treatment of industries like sugar factories, food industries, beverages industries, and distilleries.

**Solid waste management**

Basic aspects, general composition of muncipal solid wastes, aerobic treatment, anaerobic treatment, biogas generation; Solid waste management. Hazardous wastes, Biomedical wastes, E waste. MoEF rules.

**Unit III** **10 Hours**

**Bioleaching &biomining**

Microbes in Bioleaching- types, methods of bioleaching, Microbial recovery of metal, phosphate, petroleum.

**Bioremediation**

Major contaminants of air, water and soil, Biomonitors of environment (Bioindicators),

Bioremediation using microbes, Phytoremediation, Biofilms its applications. Bio-stimulation of Naturally occurring microbial activities, Bio-augmentation.

**Unit IV** **10 Hours**

**Biofuels**

Definition, Renewable and non renewable resources. Advantages and disadvantages of biofuels. Biofuel feed stocks-sugar, starch, cellulose, lipid. Types of biofuel- first,second and third generation. Technologies for bio-fuel production–transesterification, gassification. 2G technology, Biomethanation. Issues of biofuel production and its use. Microbial fuel cells. **Biodiversity:** Value of biodiversity, threats to biodiversity, approaches of biodiversity conservation.

Text Books:


1. Text Book of Environmental Biotechnology by Pradipta Kumar Mahopatra,2006.
2. Text book of Microbiology by R C Dubey and D K Maheshwari,2013


Reference books:


1. Environmental Biotechnology, A Biosystems ApproachDe Vallero,2010
2. Comprehensive Biotechnology Vol. 1- 4: M.Y. Young (Eds.), Pergamon Press 2004
3. Environmental Biotechnology by Vallero, Elsevier Science,2010
4. Biotechnology, Economic & Social Aspects : E.J. Dasilva, C Ratledge& A Sasson, Cambridge Univ. Press, 2003

| Sub. Code | UCV634N | Subject | Groundwater |
|---|---|---|---|
| Offering Department | Civil Engineering | Faculty | Prof. S. M. Kalagudi |

**Brief description of the course:**

The objective this course is to appreciate groundwater as an important natural resource on the planet earth, general factors controlling its occurrence and distribution in different areas. Focuses on groundwater exploration, quality, pollution, recharge, development and management.

**Unit I** **10 Hours**

Introduction:

Hydrology, hydrogeology, groundwater, scope, historical background, sources of groundwater, importanceof groundwater, groundwater resources, groundwater development in India, groundwater potential in India, groundwater in hydrological cycle, origin and age of groundwater.

**Unit II** **10 Hours**

**Occurrence of Groundwater**: Rock and soil properties affecting groundwateroccurrence,vertical distribution of groundwater, Aquifers – types of aquifers, geological formations as aquifers. Springs, hot springs- geothermal energy sources.

**Unit III** **10 Hours**

**Groundwater Exploration:** Geological and hydrological methods, surface geophysical methods – electrical resistivity method. Water wells – types of wells – dug wells, bore wells, driven wells, jetted wells.

**Quality of Groundwater:** Natural groundwater quality, principal chemical constituents in groundwater, sources of salinity, quality criteria for groundwater use – domestic use, live stock use, irrigation use and industrial use.

**Unit IV** **10 Hours**

**Groundwater Recharge:** Methods of artificial recharge of groundwater and rain water harvesting.

**Groundwater pollution and Legislation:** Sources and nature of pollution,detection and prevention, saline water intrusion.

**Groundwater management and conjunctive use.**

Text Books:

1. 1. Groundwater Hydrology by David Keith Todd, Third Edition, John Wiley & Sons, New York. 2./willey India Pvt.Ltd, New Delhi.
2. Groundwater by H. M. Raghunath, Third Edition, New Age International Publishers, New Delhi.
3. Groundwater Assessment and Management' by Karanth K R, Tata McGraw Hill Ltd. Publishing Co. Ltd., New Delhi.
4. Engineering and General Geology by Parbin Singh, Eighth revised Edition, S.K. Kataria and Sons, New Delhi.

Reference books:

**1.** Groundwater Hydrology by Bower, John Wiley & sons. New York.

2. Groundwater System Planning & Management – R. Willes& W. W. G. Yeh, Prentice Hall.

3. Applied Hydrogeology by C. W. Fetter, CBS Publishers & Distributer. New Delhi.

4. Fundamentals of Hydrogeology by Sanjay Akhauri., Zorba Books.com

| Sub. Code | UCV 633N | Subject | Air Pollution and Control |
|---|---|---|---|
| Offering Department | Civil Engineering | Faculty | Dr G.B.Megeri |

**Brief description of the course:**

The objective of the course is to impart the knowledge and understanding of causes and effects of air pollution and their controlling mechanisms. The course will provide a deeper understanding of air pollutants, pollution inventory and modelling. The course also imparts knowledge on the impacts of air pollution on different aspects such as policy, human health and various contemporary technological innovation for betterment of air quality.

**Unit I** **10 Hours**

**Introduction:**

Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Atmosphere and water bodies

**Unit II** **10 Hours**

**Meteorology:**

Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths. Development of air quality models-Gaussian dispersion model

**Unit III** **10 Hours**

**Sampling:**

Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, $SO_X$, $NO_X$, CO, $NH_3$)and Air pollution emission standards

**Unit IV** **10 Hours**

**Control Techniques:**

Air pollution control devices, equipment and their design.Particulate matter and gaseous pollutants- settling chambers, cyclone separators, scrubbers, filters & ESP.Including Numerical problems

**Text Books:**

1. M. N. Rao and H V N Rao, “Air pollution”, Tata Mc-Graw Hill Publication.

2. H. C. Perkins, “Air pollution”. Tata McGraw Hill Publication

3. Mackenzie Davis and David Cornwell, “Introduction to Environmental Engineering” McGraw-Hill Co.

**Reference Books:**

1. Noel De Nevers, “Air Pollution Control Engineering” , Waveland Pr Inc.

2. Anjaneyulu Y, “Text book of Air Pollution and Control Technologies”, Allied Publishers

| Sub. Code | UCS632N | Subject | Artificial Intelligence and Robotics |
|---|---|---|---|
| Offering Department | Computer Science and Engineering | Faculty | Dr. Sanjeevakumar M. Hatture |

**Brief description of the course:**

Artificial Intelligence(AI) is the activity devoted to making machines intelligent i.e. a major step forward in how computer system adapts, evolves and learns. The robotics will provide the insight into different sensors and actuators for designing and control operations. AI and robotics has widespread applications in almost every industry and is considered to be a big technological shift, similar in scale to past events such as the industrial revolution, the computer age, and the smart phone revolution. This course will give an opportunity to gain expertise in fascinating and fastest growing areas of AI and robotics that covers topics related to human intelligence and its applications in industry, defence, healthcare, agriculture and many other areas. This course will give the students a rigorous, advanced and professional graduate-level foundation in the area of Artificial Intelligence and Robotics.

**Unit I** **10 Hours**

1. **What is AI?** The AI Poblems, Underlying assumptions, AI technique, Level of the model, Criteria for success (1.1to 1.5 from Rich and Knight)
2. **Problems**, problem spaces and search Problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search problems, additional problems (2.1 to 2.6 from Rich and Knight)

**Unit II** **10 Hours**

3. **Using predicate logic** Representing simple facts in logic, representing instance and is-a relationships, computable functions and predicates, resolution, natural deduction (5.1 to 5.5 from Rich and Knight)
4. **Search and control strategies** Introduction, Generate and Test, Hill Climbing, Simulated annealing(3.1, 3.2 from Rich and Knight)

**Unit III** **10 Hours**

5. **Introduction:** What Is a Robot Anyway?: The Seven Criteria of Defining a Robot, Robot Categories, Sensors, Actuators, End Effectors, Controllers, Scenario, Giving the robot instructions.

**Robot Vocabularies and RSVP:** Additional Effort, Actions, The Autonomous Robot's ROLL Model, RSVP (Robot Scenario Visual Planning): Mapping the Scenario, Pseudocode and Flowcharting RSVP

| Unit IV | 10 Hours |
|---|---|

**7. Actual Capabilities of Robot:** The Reality Check for the Microcontroller, Sensor Reality Check, Determine Your Robot's Sensor, Limitations, Actuators End-Effectors Reality Check.

**8. Sensors:** Types of Sensors, Sensor Interfacing with Microcontrollers, Attributes of Sensors, Sensor Calibration.

**9. Programming the Robot's Sensors:** Color Sensor, Ultrasonic Sensor, Compass Sensor

Text Books:


1. Artificial Intelligence Elaine Rich, Kevin Knight and Shivashankar B. Nair TMH Education (P) Ltd., New Delhi 3rd Edition, 2010
2. Robot Programming: A Guide to Controlling Autonomous Robots Cameron Hughes Tracey Hughes Pearson Education 1stEdition, 2016


Reference books:


1. Artificial Intelligence: A modern approach Stuart Russell and Peter Norvig Pearson Education, India 3rdEdition
2. Artificial Intelligence Saroj Kaushik Cengage Learning India 1st Edition, 2011
3. Introduction to AI Robotics Robin R. Murphy MIT Press 1st Edition, 2000
4. Introduction to Robotics Saha S. K. TMH Publications 1st Edition, 2008

| Sub. Code | UCS631N | Subject | Machine Learning Using Python |
|---|---|---|---|
| Offering Department | Computer Science and Engineering | Faculty | S. S. Yendigeri |

**Brief description of the course:**

Machine Learning, which is a subset of Artificial Intelligence (and in turn a subset of Data Science) is an up and coming field of study which is revolutionizing the way companies analyze and derive conclusions from their data. Companies from various domains have seen huge increases in revenue and profit after adopting ML to reinforce their business decision making. Hence, the demand for capable data scientists and engineers is at an all time high regardless of their original specialization. While CS and IS students are familiar with ML, it's still a mysterious topic to students of other branches. Through this course, I intend to demystify and introduce them to the exciting world of machine learning to non CS/IS students and hopefully set them up for a rewarding and lucrative career in their future.

**Unit I** **10 Hours**

**Introduction:**
What is Machine Learning? Python: Introduction, Data Types, Conditional statements, loops, functions, scikit-learn.
Essential Libraries and Tools: Jupyter Notebook, Numpy, Pandas, Scipy, matplotlib, A First Application: Classifying Iris Species.

**Unit II** **10 Hours**

**Supervised Learning:** Classification and Regression, Generalization, Overfitting, and Underfitting, Supervised Machine Learning Algorithms: Some Sample Datasets, k-Nearest Neighbors, Linear Models, Naïve Bayes Classifiers, DecisionTrees, Neural Networks (Deep Learning).

**Unit III** **10 Hours**

**Unsupervised Learning and Preprocessing:** Types of Unsupervised Learning, Challenges in Unsupervised Learning, Preprocessing and Scaling, Dimensionality Reduction, Feature Extraction, and Manifold Learning, Clustering: k-Means Clustering, Agglomerative Clustering

**Unit IV** **10 Hours**

**Model Evaluation and Improvement**: Cross-Validation, Evaluation Metrics and Scoring. **Working with Text Data:** Types of Data Represented as Strings, Example Application: Sentiment Analysis of Movie Reviews, Representing Text Data as a Bag of Words: Applying Bag-of-Words to a Toy Dataset, Bag-of-Words for Movie Reviews, Stopwords.

Text Books:


1. Introduction to Machine Learning with Python Andreas C. Müller & Sarah Oreilly Publication 1st Edition, 2016
2. Introduction to Python Gourishankar S. CSC Press 1st Edition


Reference books:

1. Core Python Programming Dr. R. Nageshwar Rao Dream Tech Press 2nd Edition, 2018
3. Machine Learning Tom Mitchell McGraw-Hill 2nd Edition, 2013
4. Building Machine Learning Systems with Python Luis Pedro Coelho
And Willi Richart PACKT Publication 2nd Edition,2013

| Sub. Code | UEE655N | Subject | Renewable Energy Sources |
|---|---|---|---|
| Offering Department | Electrical and Electronics Engineering | Faculty | Sunita S Tambakad |

**Brief description of the course:**

Renewable energy and its impact on the environment is a topic that's been on everyone's minds in recent years not only because it's at the forefront of many political and social conversations worldwide, but because it is an issue so many people feel passionate about. Renewable energy is energy that is collected from natural sources that can't be depleted such as sunlight, wind, and hydropower. And since these natural sources aren't going anywhere anytime soon, using them to generate power is not only reliable but is eco-friendly, too. Plus, these types of alternative energy sources don't typically produce any negative byproducts like those produced when burning fossil fuels for energy, which causes serious harm to the environment.

**Unit I** **10 Hours**

**Introduction to Energy Sources:** **02Hrs**

Classification of Energy Resources; Conventional Energy Resources – Availability and their limitations; Non-Conventional Energy Resources– Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources.

**Solar Energy Basics:** **04Hrs**

Introduction, Solar Constant, Basic Sun-Earth Angles – definitions and their representation, Solar Radiation Geometry (only theory); Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer.

**Solar Thermal Systems:** **04Hrs**

Principle of Conversion of Solar Radiation into Heat, Solar Water Heaters (Flat Plate Collectors), Solar Cookers – Box type, Concentrating dish type; Solar driers, Solar Still.

**Unit II** **10 Hours**

**Solar Electric Systems:** **05Hrs**

Solar Thermal Electric Power Generation – Solar Pond and Concentrating Solar Collector (parabolic trough, parabolic dish, Central Tower Collector). Advantages and Disadvantages; Solar Photovoltaic – Solar Cell fundamentals, module, panel and array. Solar PV Systems – Street lighting, Domestic lighting and Solar Water pumping systems.

**Wind Energy:** **05Hrs**

Wind and its Properties, History of Wind Energy. Basic principles of Wind Energy Conversion

Systems (WECS), Classification of WECS, Parts of a WECS, Derivation for Power in the wind, Advantages and Disadvantages of WECS

**Unit III** **10 Hours**

**Biomass Energy:** **05Hrs**

Introduction, Photosynthesis process, Biomass conversion technologies; Biomass Gasification – Principle and Working of Gasifiers, Biogas - production of biogas, factors affecting biogas generation, types of biogas plants–KVI Cand Janata model.

**Geothermal Energy:** **05Hrs**

Introduction, Geothermal resources (brief description); Advantages and disadvantages; Applications of Geothermal Energy.

**Unit IV** **10 Hours**

**Energy from Ocean:** **06Hrs**

Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Advantages and Limitation of TPP.

Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Advantages and Limitation of OTEC.

**Emerging Technologies:** **04Hrs**

Fuel Cell, Wave Energy. (Principle of Energy generation using block diagrams, advantages and limitations).

Text Books:


1. Khan, B. H., Non-Conventional Energy Resources, TMH, New Delhi, 2006.
2. Rai, G. D., Non-Conventional Sources of Energy, IV- Edition, Khanna Publishers, Delhi, 2007


Reference books:


1. Mukherjee, D., and Chakrabarti, S., Fundamentals of Renewable Energy Systems, Age International Publishers, 2005.
2. Tiwari, G. N., and Ghosal,M.K., Renewable Energy Sources: Basic Principles Applications, Alpha Science International, Ltd., New Delhi, 2006.

| Sub. Code | UEC634N | Subject | Modeling and Simulation of Engineering Systems |
|---|---|---|---|
| Offering Department | Electronics and Communication Engineering | Faculty | Dr. B. G. Sheeparamatti |

**Brief description of the course:**

Gist of the subject: As an introductory course for modeling, simulation and analysis of real life physical systems containing individual or mixed mechanical, electrical, thermal and fluid elements. Simulate and Analyze the developed models using modeling and simulation tools.

| Unit I | 10 Hours |
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**Introduction to Systems:** Introduction, types, properties of systems, LTI Systems, Stability of systems. Non linear systems

**Mathematical Modeling:** Introduction, types of modeling, Abstraction, Linearity and superposition, balance and conservation laws and the system, boundary approach. Basic system elements in mechanical, electrical, fluid, magnetic and thermal systems

| Unit II | 10 Hours |
|---|---|

**Mathematical Modeling of Basic Engineering Systems:** Introduction, Differential equations of basic engineering systems, Transfer functions, Block diagram algebra, Signal flow graphs.

**Lumped Parameter Models:** Mechanical systems (automobile suspension system, accelerometer), translational, rotational (simple rotational system). hydraulic systems (two tank hydraulic system), thermal systems (simple thermal system). Electrical Systems (capacitor microphone).

| Unit III | 10 Hours |
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**Analysis of Systems:** Introduction, time domain analysis of first order and second order systems**,** Frequency response of Linear Time invariant systems: Bode plots, phase margin and gain margin, stability analysis: Routh Hurvitz criteria. Introduction to State space representation of systems.

| Unit IV | 10 Hours |
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**Modeling and Simulation tools:** Introduction, familiarization with modeling and simulation software, Simulation and analysis of mathematical models developed. Introduction to non-linear systems and linearization. Curve fitting in system modeling.

Reference books:

1. Mukherjee A. and Karmakar R. - 'Modeling and Simulation of Engineering Systems through Bondgraphs' - Narosa – 2000
2. I J Nagrath, M Gopal – Control Systems Engineering, New Age International Publishers, Fifth Edition, 2007
3. O. Beucher and M. Weeks - Introduction to MATLAB and Simulink a project

| Sub. Code | UEC635N | Subject | Image processing |
|---|---|---|---|
| Offering Department | Electronics and Communication Engineering | Faculty | Dr. V. S. Jigajinni |

**Brief description of the course:**

About the subject:

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image.

Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too. Its helps for students to implement their final year projects.

| Unit I | 10 Hours |
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Introduction to Image processing: Fundamental steps in image processing; Components of image processing system; image sensing and acquisition; sampling and quantization; representation of digital images, image interpolation, Basic relationship between pixels; arithmetic and logic operations.

| Unit II | 10 Hours |
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Transformation and spatial filtering: Basics of intensity transformation and functions, Histogram Processing, equalization and histogram matching.Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters. Image Restoration: Image Restoration: Image Degradation/Restoration Process, Noise Models.

| Unit III | 10 Hours |
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Restoration in the Presence of Noise Only-Spatial Filtering, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering,Color image processing: fundamentals, color models pseudo colour image processing, colour transformations.

| Unit IV | 10 Hours |
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Image Compression: Fundamentals, Image Compression Models and methods: Huffman coding, Golomb coding, arithmetic coding, LZW coding JPEG, predictive coding. Digital watermarking Applications in satellite, sonar, radar, medical areas and process industries.

Text Books:

1. R. C. Gonzalez, R. E. Woods, “Digital Image processing”, Addison Wesley/ Pearson education, New Delhi, India, 3rd edition, 2002.

Reference books:

1.A. K. Jain, “Fundamentals of Digital Image processing”, Prentice Hall of India, New Delhi, 2nd Edition, 1997.

2. Rafael C. Gonzalez, “Digital Image processing using MATLAB”, Richard E. Woods and Steven Low price Edition, Pearson Education Asia, India, 2nd Edition, 2004.

3. William K. Pratt, “Digital Image Processing”, John Wiley & Sons, New Delhi, India, 3 rd edition, 2004.

4. Arthur R. Weeks, Jr, “Fundamentals of Electronic Image Processing”, SPIE Optical Engineering Press, New Delhi, India, 2nd Edition, 1996.

5. S. Jayaraman, S. Esakkirajan, T. Veerakumar, “Digital Image Processing”, Tata McGraw-Hill Education.

| Sub. Code | UEI631N | Subject | INSTRUMENTAL METHODS OF ANALYSIS |
|---|---|---|---|
| Offering Department | Electronics and Instrumentation Engg. | Faculty | Dr. K. Bhat |

**Brief description of the course:**

Syllabus deals with principle of working, construction and application of analytical instruments and methods for the analysis of gaseous/liquid/solid samples. These instruments work on physical, chemical and physico-chemical principles

| Unit I | 10 Hours |
|---|---|

**Introduction**: Analytical methods, **Electromagnetic Spectrum**: Properties of electromagnetic radiation and interaction with matter. **Molecular Spectroscopy**: Measurement of transmittance and absorbance, Beer Lambert's law and its limitations, Components of analytical instruments: Sources of radiation, Wavelength selectors, Sample containers, Detectors. **UV-Visible Absorption Spectrometry**: Single and double beam absorption instruments, Application for qualitative and quantitative analysis.

| Unit II | 10 Hours |
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**IR Absorption Spectrometry:** Basic components of IR instruments, Non-dispersive spectrometers: Filter photometers, Photometers without filters, Filter correlation analyzers. **Mass Spectrometry**: Features of mass spectroscopy, Components of spectrometers: Sample inlet systems, Electron impaction source, Mass analyzers-Single focus and double focus magnetic sector analyzer, Quadrupole analyzer and time of flight (TOF) analyzer, Applications.

| Unit III | 10 Hours |
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**Atomic Spectroscopy**: Principles of AAS, AES and AFS, Sample atomization techniques, Atomic absorption instrumentation, Applications. **X-ray Techniques:** Introduction, Principles, Sources, Detectors, Instrumentation, X-ray absorption method - Absorptiometer, X-ray fluorescence method-Energy dispersive type, X-ray diffraction-powder diffraction method and applications.

| Unit IV | 10 Hours |
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**Chromatography:** Introduction, Classification, Gas chromatography: Principle, GLC instrumentation, Liquid chromatography: Scope and HPLC instrumentation, Applications. **NMR Spectroscopy:** Principles of NMR spectroscopy, Different types of NMR instruments:

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| FT – NMR, Carbon-13 NMR, Applications. |
| Text Books: |
| 1. Douglas A. Skoog, James Holler, Stanley R. Crounch, “Instrumental Analysis”, Cengage Learning Publication, 2007.<br>2. H. H. Willard, L. L. Merritt, J. A. Dean, F. A. Settle, “Instrumental Methods of Analysis”, 7th Edition, CBS Publishing and Distribution, 1986. |
| Reference books: |
| 1 R. S. Khandpur, “Hand Book of Analytical Instrumentation”, TMH, 1989. |

| Sub. Code | UIP635N | Subject | MATERIALS MANAGEMENT |
|---|---|---|---|
| Offering Department | Industrial and Production Engineering | Faculty | Dr C. M. Javalagi |

**Brief description of the course:**

Materials Management:

The need for materials management was first felt in manufacturing undertakings. The servicing organizations also started feeling the need for this control. And now even non-trading organizations like hospitals, universities etc. have realized the importance of materials management. Every organization uses several materials. It is necessary that these materials are properly purchased, stored, and used.

Any avoidable amount spent on materials or any loss due to wastage of materials increases the cost of production. The object of materials management is to attack materials cost on all fronts and to optimize the overall end results. It is the control of materials in such a manner that it ensures maximum return on working capital.

Defn.: “Material management is the planning, directing, controlling and co-ordination of all those activities concerned with material and inventory requirements, from the point of their inception to their introduction into manufacturing process.”

“Material management is the integrated functioning of the various sections of an organization dealing with the supply of materials and allied activities in order to achieve maximum co-ordination.”

Importance of Material Management:

Material management is a service function. It is as important as manufacturing, engineering, and finance. The supply of proper quality of materials is essential for manufacturing standard products.

The importance of material management may be summarized as follows:

1. The material cost content of total cost is kept at a reasonable level. Scientific purchasing helps in acquiring materials at reasonable prices. Proper storing of materials also helps in reducing their wastages. These factors help in controlling cost content of products.

2. The equipment is properly utilized because there are no break downs due to late supply of materials.

3. The wastages of materials at the stage of storage as well as their movement is kept under control.

7. The investments on materials are kept under control as under and over stocking is

avoided.

8. Congestion in the stores and at different stages of manufacturing is avoided.

Materials Management is studied in four major areas and they are:

1. Integrated concept of materials management and its importance in the corporate world.
2. Purchasing and warehouse management
3. Inventory management
4. Various methods to enhance function of materials management

| **Unit I** | **10 Hours** |
|---|---|

**Integrated Materials Management:** Importance, Need for integrated concept, Definition and scope, Advantages. Advantages of Integrated Materials Management Concept

**Corporate Policy and Materials Management:** General corporate policy, Scope, make or buy, Quality requirements, Quantity requirements.

**Materials Research-**Need and Importance, Definition and Scope, Organization for Materials Research, Techniques and Reporting

**ABC Analysis:** What is ABC Analysis-Advantages of ABC Analysis, Mechanics of ABC Analysis, Purpose of ABC Analysis,

Objective of ABC Analysis, Limitations of ABC Analysis.

| **Unit II** | **10 Hours** |
|---|---|

**Codification and Standardization:** Nature of Codification, Process of codification, Kodak System, Brisch System, Advantages of Codification, Need for Standardization, Standardization in India, Importance of Standardization, Definition of Simplification, Benefits of Standardization.

**Purchasing Management:** Creative Purchasing, Purchase Systems, Price Forecasting, Buying Seasonal Commodities, Purchasing Under Uncertainty, Purchasing of Capital Equipment, International Purchasing, Import Substitution: Prospects and Retrospect, Public Buying Insurance Buying **10Hrs**

| **Unit III** | **10 Hours** |
|---|---|

**Warehousing and Stores Management:** Stores Management, Stores Systems and Procedures, Incoming Materials Control, Stores Accounting and Stock Verification, Obsolete, Surplus and Scrap Management, Value Analysis, Material Handling, Transportation and Traffic Management.

| **Unit IV** | **10 Hours** |
|---|---|

**Inventory Management:** Inventory Management in India, Economical Ordering Quantity, Practical Inventory Systems, Computers in Materials Management, Evaluation of Materials Management.

Reference books:


1. *Gopal Krishna P. and M. Sundaresan. Materials Management*: An Integrated Approach, Prentice-Hall of India Private limited, NewDelhi, 2007, ISBN–978-81-203-0027-9.
2. Datta. A K.*Materials Management, Procedures, Text and Cases*.Prentice Hall of India Private limited, NewDelhi, 2000.
3. Materials Management Chtale
4. Materials Management by Arnold
5. Handbook of M. M. Gopalkrishnan

| Sub. Code | UIS620N | Subject | JAVAPROGRAMMING |
|---|---|---|---|
| Offering Department | Information Science and Engineering | Faculty | R. B. Math |

**Brief description of the course:**

Java is among the most popular programming languages, mainly because of how versatile and compatible it is. Java can be used for a large number of things, including software development, mobile applications, and large systems development. Most of the market share of all smart-phones run on Android, the mobile operating system is written in Java. Knowing Java opens a great deal of doors as a developer.

In this course students will be exposed to fundamental programming concepts, including object-oriented programming (OOP) using Java.

**Unit I** **10 Hours**

**Object-oriented Concepts**

**OOP Concepts**: Procedural Programming, Problems with procedural programming, Object-oriented programming, P.O.P v/s O.O.P, OOP features Encapsulation, Inheritance, Polymorphism, etc., Benefits of OOP, Applications of OOP, Pure OOP languages-five rules, The 'Object' concept, ADT, Encapsulation and Information Hiding, Class v/s Object, Type and Interface, Instantiating classes, Interaction between objects, Association, Aggregation and Decomposition, Example, Generalization and Specialization.

**Unit II** **10 Hours**

**Introduction to Java**

**Evolution of Java:** Java's lineage, Creation of Java, How Java changed the internet, Bytecode, Features of Java.

**An Overview of Java:** Features of Java, First simple program, Lexical Issues.

**Data Types and Variables:** The Primitive Types, Literals, Variables, Type Conversion and Casting, Automatic Type Promotion.

**Operators:** Arithmetic operator, Bitwise operators, Relational operators, Boolean Logical operators, Assignment operators, The'?' Operator, Operator precedence.

**Control Statements:** Java's selection statements, Iteration statements, Jump statements.

**Unit III** **10 Hours**

**Arrays, Classes Arrays:** One-dimensional arrays, Multi-dimensional arrays.

**Introducing Classes:** Class fundamentals, Declaring Objects, Assigning object reference variables, Introducing methods, Constructors, The 'this' keyword.

**Methods and Classes:** Overloading methods, Introducing Access control, Understanding static, Introducing final.

| Unit IV | 10 Hours |
|---|---|

**Inheritance and Threads**

**Inheritance:** Inheritance basics- Member access and inheritance, Using super, Multi-level inheritance, Method overriding; Dynamic method dispatch, abstract classes, using 'final' with inheritance.

**Multithreaded programming:** The Java Thread model, The Main thread, Creating a thread, Creating multiple threads, Thread priorities, Synchronization, Inter-thread communication, Suspending, Resuming and Stopping threads.

Text Books:


1. The Complete Reference-Java, Herbert Schildt, 7th edition, McGraw Hill Publication.
2. Programming with Java–A primer, E. Balaguruswamy, 4th edition, McGraw Hill Publication.


Reference books:


1. Java for programmers, Paul J. Deitel and Harvey M. Deitel, Pearson Education.
2. Introduction to Java programming, Y. Daniel Liang,7th edition, Pearson Education

| Sub. Code | UIS002N | Subject | Database Management System |
|---|---|---|---|
| Offering Department | Information Science and Engineering | Faculty | Prof. P. V. Kulkarni |

**Brief description of the course:**

Databases and database systems have become an essential component of everyday life in modern society. In the course of a day, most of us encounter several activities that involve some interaction with a database. For example, if we go to the bank to deposit or withdraw funds; if we make a hotel or airline reservation; if we access a computerized library catalog to search for a bibliographic item; or if we order a magazine subscription from a publisher, chances are that our activities will involve someone accessing a database. Even purchasing items from a supermarket nowadays in many cases involves an automatic update of the database that keeps the inventory of supermarket items. The above interactions are examples of what we may call traditional database applications, where most of the information that is stored and accessed is either textual or numeric. In the past few years, advances in technology have been leading to exciting new applications of database systems. Multimedia databases can now store pictures, video clips, and sound messages. Geographic information systems (GIS) can store and analyze maps, weather data, and satellite images. Data warehouses and on-line analytical processing (OLAP) systems are used in many companies to extract and analyze useful information from very large databases for decision making. Real-time and active database technology is used in controlling industrial and manufacturing processes. And database search techniques are being applied to the World Wide Web to improve the search for information that is needed by users browsing through the Internet.

**Unit I** **10 Hours**

**INTRODUCTION:** Characteristics of database approach; Advantages of using DBMS approach; Usage of DBMS. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems.

**ENTITY-RELATIONSHIP MODEL**: Using High-Level Conceptual Data Models for Database Design; An example database application; Entity types, Entity sets, Attributes and Keys; Relationship types, Relationship sets, Roles and Structural constraints; Weak entity types;

Refining the ER Design; ER Diagrams, Naming conventions and design issues.

**Unit II** **10 Hours**

**RELATIONAL MODEL AND RELATIONAL DATABASE CONSTRAINTS**: Relational model concepts; Relational model constraints and Relational database schemas; Update operations, Transaction and dealing with constraint violations.

**SQL**: data definition and data types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL queries. Insert, Delete and Update statements in SQL; Specifying constraints as Assertion and Trigger; Views (Virtual Tables) in SQL;

**Unit III** **10 Hours**

**DATABASE DESIGN**: Informal design guidelines for relation schemas; Functional dependencies; Normal forms based on primary keys; General definitions of second and third normal forms; Boyce-Codd Normal Form

**PROPERTIES OF RELATIONAL DECOMPOSITIONS**: Algorithms for relational database Schema design; Multivalued dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form.

**Unit IV** **10 Hours**

**TRANSACTION MANAGEMENT**: Introduction to transaction processing; Transaction & system concepts; Desirable properties of transactions; Characterizing schedules based on recoverability; Characterizing schedules based on serializability; Transaction support in SQL; Transaction Control in SQL.

Text Books:


1. Fundamentals of Database Systems", Remez Elmasri & Shamkant B. Navathe, 5th Edition, Pearson Education.
2. "Oracle PL/SQL by Example", BENJAMIN ROSENZWEIG, ELINA RAKHIMOV, 5th Edition, Pearson Education


Reference books:


1. Database Management Systems", Ramakrishanan Gehrke 3rd edition, McGraw-Hill Higher Education;
2. "An Introduction to Data base systems", C. J. Date, Addison Wesley, 4th edition.

| Sub. Code | UME642N | Subject | Finite Element Method |
|---|---|---|---|
| Offering Department | Mechanical Engineering | Faculty | Basavaraj R. Endigeri |

**Brief description of the course:**

The objective of the course is to appraise the students about the basics of the Finite Element Technique, a numerical tool for the solution of different classes of problems in solid mechanics. Different application areas will be dealt with after introducing the basic aspects of the method.

It is expected that once the students are exposed to the course, they will be in a position to solve any physical problem using Finite Element technique.

The target audience of the course is the Undergraduate students from Civil and Automobile Engineering

| Unit I | 10 Hours |
|---|---|

Introduction: Equilibrium equations in elasticity subjected to body force, traction forces, stress strain relations for plane stress and plane strain, Boundary conditions, Initial conditions, Euler's Lagrange's equations of bar, beams, Principle of a minimum potential energy, principle of virtual work, Rayleigh-Ritz method Galerkins method and Matrix techniques . Basic Procedure: General description of Finite Element Method, , Discretization process; types of elements 1D, 2D and 3D elements, size of the elements, location of nodes, node numbering scheme, half Bandwidth, Stiffness matrix of bar element by direct method, Properties of stiffness matrix, Preprocessing, post processing. Engineering applications of finite element method. Advantages & Disadvantages of FEM.

| Unit II | 10 Hours |
|---|---|

Interpolation Models: Polynomial form of interpolation functions- linear, quadratic and cubic, Simplex, Complex, Multiplex elements, Selection of the order of the interpolation polynomial, Convergence requirements, static condensation. penalty approach and elimination method. One-dimensional bar element: Recall of 1D linear bar element. Lagrangian interpolation, Higher order one dimensional elements- quadratic, Cubic element and their shape functions, properties of shape functions, Effect of temperature on 1D elements and stress calculation..

| Unit III | 10 Hours |
|---|---|

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|---|
| TWO dimensional elements: Shape functions and stiffness matrix of 2D elements four-Node quadrilateral, Nine-Node quadrilateral Eight-Node quadrilateral, serendipity and lagrange comparison with 2D pascals triangle. CST and LST shape functions, jacobian matrix , stiffness matix, force terms, stress calculation and Numerical integration. Introduction to 3-D elements shape function of tetrahedron element. |
| **Unit IV** **10 Hours** |
| TRUSSES AND BEAM ELEMENTS: Analysis of trusses and beam elements its shape functions, stiffness matrix and stress calculation |
| Text Books: |
| 1. Finite Elements in engineering, Chandrupatla T.R., 3rd Pearson Edition.<br>2. Finite Element Analysis, C. S. Krishnamurthy,–Tata McGraw Hill Publishing Co. Ltd, New Delhi, 1995.<br>3. “Fundamental Finite Element Analysis and Application” by “Asghar Bhatti” by Page Turner 2013.<br>4. “Advanced Topics in Finite Element Analysis of Structures with Mathematica and MATLAB Computations” by M. Asghar Bhatti by Page Turner 2013. |
| Reference books: |
| 1. The FEM its basics and fundamentals: O. C. Zienkiewicz, Elsevier.<br>2. Finite Element Method, J. N. Reddy, McGraw –Hill International Edition.<br>3. Finite Element Methods, by Daryl. L. Logon, Thomson Learning 3rd edition, 2001.<br>4. Finite Element Analysis, by H.V. Lalshminarayana, universities press, 2004. |

| Sub. Code | UME639N | Subject | Product Design & Rapid Prototyping |
|---|---|---|---|
| Offering Department | Mechanical Engineering | Faculty | S C Yali |

**Brief description of the course:**

Product Design is related to all the work that is done between an idea coming to mind and finally seeing the product in the hands of the customer. Product Design course provides education of designing a product from the idea. The process often involves figuring out what is required, brainstorming possible ideas, creating mock prototypes and then generating the product. Product design is concerned primarily with the relationship between products, systems and those who use them. This course is theoretical and interdisciplinary (open for all branch).

**Unit I** **10 Hours**

**Introduction** : Definition , importance of PD, Objectives of PD, essential requirements of PD, who designs product, Project team, steps in new PD, Characteristics of successful product development, duration and cost of product development , challenges of product development, Design for manufacture, remanufacturing , sequential and concurrent engineering . **6 Hours**

**Design for manufacture & assembly:** Design for Manufacture and Assembly, History , Implementation of Design for Assembly , Design for Manufacture , How Does DFMA Work, Advantages of Applying DFMA during Product Design, design for Maintainability, Design for Environment Design for safety, Vision and Illumination design

**Unit II** **10 Hours**

**Development processes and organizations** :A generic development process, Usefulness of a well-defined Development Process, task & responsibilities for marketing, design and manufacturing , concept development: the front end process, adopting the generic product development process, process flow diagram for variant of products, product development organizations (functional, project & matrix)

**Unit III** **10 Hours**

**Introduction:** Prototype fundamentals, definition of Prototypes, types of prototypes, need for the compression in product development, RP fundamentals , RP wheel, history of RP systems, applications of RP, growth of RP industry, basic principle of rapid prototyping

processes, classification of RP systems. advantages and disadvantages of rapid prototyping

**Stereolithogrphy systems:** principle, process details , advantages and disadvantages, applications

| **Unit IV** | **10 Hours** |
|---|---|

**Selective Laser sintering:** principle, process details, advantages and disadvantages, applications

**Fused deposition modelling**: principle, , process details , advantages and disadvantages, applications

**Laminated object manufacturing :** principle, process details, LOM materials advantages and disadvantages, applications

**Solid Ground curing:** principle of operation , machine details, advantages and disadvantages, applications

Text Books:

1. Product design & development by Karl T Ulrich and Steven D Eppinger
2. Rapid Prototyping principles and applications by C K Chua, K F Leong and C S Lim

Reference books:

1. The design of everyday things by Don Norman
2. Product designs from concept to Manufacture by Jennifer Hudson
3. Additive manufacturing by Brent Stucker, David W. Rosen, and lan Gibson
4. Engineering design and rapid prototyping by Ali K. Kamrani and Emad Abouel Nasr

| Sub. Code | UBA631N | Subject | CORPORATE COMMUNICATION |
|---|---|---|---|
| Offering Department | Master of Business Administration | Faculty | Vaibhav Deshpande |

**Brief description of the course:** Corporate Communication covers introductory concepts of communication, channels and objectives of communication, methods and modes of communication, and business letters. Syllabus is framed in such a way that students will learn the subject through classroom teaching and through activities and case studies.

**Unit I** **10 Hours**

Meaning, Definition, Process, Need, Feedback, Emergence of Communication as a key concept in the Corporate and Global world, Impact of technological advancements on Communication

**Unit II** **10 Hours**

**Channels and Objectives of Communication**

Channels-Formal and Informal—Vertical, Horizontal, Diagonal, Grapevine, Objectives of Communication, Information, Advice, Order and Instruction, Persuasion, Motivation, Education, Warning, and Boosting the Morale of Employees (A brief introduction to these objectives to be given)

**Unit III** **10 Hours**

**Methods and Modes of Communication**

Methods: Verbal and Nonverbal, Characteristics of Verbal Communication, Characteristics of Non-verbal Communication, Business Etiquette Modes: Telephone and SMS Communication) Facsimile Communication (Fax) Computers and E-communication, Video and Satellite Conferencing. Problems in Communication /Barriers to Communication—Physical/ Semantic / Language/ Socio-Cultural /Psychological /Barriers, Ways to Overcome these Barriers

**Unit IV** **10 Hours**

**Business Correspondence**

Order, Credit and Status Enquiry, Collection (just a brief introduction to be given) Only following to be taught In detail: Letters of inquiry, Letters of Complaints, Claims, Adjustment, Sales Letters, promotional leaflets and fliers Consumer Grievance Letters.

**Presentation skills:** What is a presentation – Elements of presentation –

Designing & Delivering Business presentation advanced visual support for manager.

Text Books:


1. Balan, K. R. and Rayudu C. S. (1996) Effective Communication, Beacon NewDelhi
2. Bangh, L Sue, Fryar, Maridell and Thomas David A. (1998) How to Write First Class Business Correspondence, N.T.C. Publishing Group USA.
3. Bhargava and Bhargav, Company Notices, Meetings and Regulations
4. Ghanekar. A (1996) Communication Skills for Effective Management Everest Publishing House, Pune.