SCHEME of AUDIT COURSE AND OPEN ELECTIVE COURSES

List of Audit Courses 1:

Sr.No.	Course	Code	To be taught by Department
1.	English for Research paper writing	AC01	CMT
2.	Disaster Management	AC02	ESE
3.	Value Education	AC04	Religious Study
4.	Stress Management by Yoga	AC07	Physiotherapy

List of Audit Courses 2:

Sr.No.	Course	Code	To be taught by Department
1.	Sanskrit for Technical Knowledge	AC03	Religious Study
2.	Constitution of India	AC05	Faculty of Law
3.	Pedagogy Studies	AC06	HRDC
4.	Personality development through Life Enlightenment Skills	AC08	Applied Psychology

List of Electives-III (Open Elective): The student can opt any one Open elective from the following list. If the no. of students in a particular open elective is less than 15, it will not be offered.

Sr. No.	Course	Code
1.	Business Analytics	3OE01
2.	Industrial Safety	3OE02
3.	Operations Research	3OE03
4.	Cost Management of Engineering Projects	3OE04
5.	Composite Materials	30E05
6.	Waste to Energy	3OE06
7.	Advancements in Communication System	3OE07
8.	Introduction to soft computing Techniques	3OE08
9.	Advanced Printing Technology	3OE09
10.	Computer Aided Design & Manufacturing	3OE10
11.	Food Safety and Quality Assurance	3OE11

Syllabus of Audit Courses and Open Elective Courses

AC01 ENGLISH FOR RESEARCH PAPER WRITING

0 Credits (2-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course objectives:
Students will be able to:
1. Understand that how to improve your writing skills and level of readability.
2. Learn about what to write in each section.
3. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

Units	Contents	Hours
1.	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness	4
2.	Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction	4
3.	Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.	4
4.	Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature	4
5.	Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions	4
6.	Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission	4

Suggested Studies:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press Model Curriculum of Engineering & Technology PG Courses [Volume -II] [300]
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht HeidelbergLondon, 2011

AC02 DISASTER MANAGEMENT

0 Credits (2-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course Objectives: -

Students will be able to:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

Units	Contents	Hours
1.	**Introduction** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	4
2.	**Repercussions Of Disasters And Hazards** Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Manmade disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	4
3.	**Disaster Prone Areas In India** Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics	4
4.	**Disaster Preparedness And Management** Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	4
5.	**Risk Assessment** Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National	4

	Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.	
6.	**Disaster Mitigation** Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	4

1. SUGGESTED READINGS:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep & Deep Publication Pvt. Ltd., New Delhi.

AC04 VALUE EDUCATION

0 Credits (2-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course Objectives:-

Students will be able to

1. Understand value of education and self- development
2. Imbibe good values in students Model Curriculum of Engineering & Technology PG Courses [Volume -II] [302]
3. Let the should know about the importance of character

Unit	Content	Hours
1.	• Values and self-development –Social values and individual attitudes. • Work ethics, Indian vision of humanism. • Moral and non- moral valuation. Standards and principles. • Value judgments	4
2.	• Importance of cultivation of values. • Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. • Honesty, Humanity. Power of faith, National Unity. • Patriotism. Love for nature ,Discipline	6
3.	• Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. • Punctuality, Love and Kindness. • Avoid fault Thinking. • Free from anger, Dignity of labour. • Universal brotherhood and religious tolerance. • True friendship. • Happiness Vs suffering, love for truth. • Aware of self-destructive habits. • Association and Cooperation. • Doing best for saving nature	6
4.	• Character and Competence –Holy books vs Blind faith. • Self-management and Good health. • Science of reincarnation. • Equality, Nonviolence, Humility, Role of Women. • All religions and same message. • Mind your Mind, Self-control. • Honesty, Studying effectively	6

Suggested reading

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi.

Course outcomes

Students will be able to

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

AC07 STRESS MANAGEMENT BY YOGA

0 Credits (2-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course Objectives:-
1. To achieve overall health of body and mind
2. To overcome stress

Unit	Content	Hours
1.	• Definitions of Eight parts of yog. (Ashtanga)	8
2.	• Yam and Niyam. Do`s and Don't's in life. i. Ahinsa, satya, astheya, bramhacharya and aparigraha ii. Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	8
3.	• Asan and Pranayam i. Various yog poses and their benefits for mind & body ii. Regularization of breathing techniques and its effects-Types ofpranayam	8

Suggested reading
1. 'Yogic Asanas for Group Tarining-Part-I" : Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

Course Outcomes:
Students will be able to:
1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

AC03 SANSKRIT FOR TECHNICAL KNOWLEDGE

0 Credits (2-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course Objectives

1. To get a working knowledge in illustrious Sanskrit, the scientific language in the world
2. Learning of Sanskrit to improve brain functioning
3. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
4. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Unit	Content	Hours
1.	• Alphabets in Sanskrit, • Past/Present/Future Tense, • Simple Sentences	8
2.	• Order • Introduction of roots • Technical information about Sanskrit Literature	8
3.	• Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	8

Suggested reading

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-VempatiKutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

Course Output

Students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

AC05 CONSTITUTION OF INDIA

0 Credits (2-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course Objectives:
1. Students will be able to:
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Units	Content	Hours
1.	• **History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working)	4
2.	• **Philosophy of the Indian Constitution:** Preamble Salient Features	4
3.	• **Contours of Constitutional Rights & Duties:** • Fundamental Rights • Right to Equality • Right to Freedom • Right against Exploitation • Right to Freedom of Religion • Cultural and Educational Rights • Right to Constitutional Remedies • Directive Principles of State Policy • Fundamental Duties.	4
4.	• **Organs of Governance:** • Parliament • Composition • Qualifications and Disqualifications • Powers and Functions • Executive • President • Governor • Council of Ministers • Judiciary, Appointment and Transfer of Judges, Qualifications	4

	• Powers and Functions	
5.	• **Local Administration:** • District's Administration head: Role and Importance • Municipalities: Introduction, Mayor and role of Elected representative, • CEO of Municipal Corporation. • Pachayati raj: Introduction, PRI: Zila Pachayat. • Elected officials and their roles, CEO Zila Pachayat: Position and role. • Block level: Organizational Hierarchy (Different departments), • Village level: Role of Elected and Appointed officials, • Importance of grass root democracy	4
6.	• **Election Commission:** • Election Commission: Role and Functioning. • Chief Election Commissioner and Election Commissioners. • State Election Commission: Role and Functioning. • Institute and Bodies for the welfare of SC/ST/OBC and women.	4

Suggested reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

AC06 PEDAGOGY STUDIES

0 Credits (2-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course Objectives:
Students will be able to:
1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

Units	Content	Hours

1.	• **Introduction and Methodology:**
	  • Aims and rationale, Policy background, Conceptual framework andterminology
	  • Theories of learning, Curriculum, Teacher education.
	  • Conceptual framework, Research questions**.**
	  • Overview of methodology and Searching.
		4

2.	• Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. • Curriculum, Teacher education.	2
3.	• Evidence on the effectiveness of pedagogical practices • Methodology for the in depth stage: quality assessment of included studies. • How can teacher education (curriculum and practicum) and the schoolcurriculum and guidance materials best support effective pedagogy? • Theory of change. • Strength and nature of the body of evidence for effective pedagogical practices. • Pedagogic theory and pedagogical approaches. • Teachers' attitudes and beliefs and Pedagogic strategies.	4
4.	• Professional development: alignment with classroom practices and follow-up • support • Peer support • Support from the head teacher and the community. • Curriculum and assessment • Barriers to learning: limited resources and large class sizes	4
5.	• **Research gaps and future directions**	2

	• Research design • Contexts • Pedagogy • Teacher education • Curriculum and assessment • Dissemination and research impact.	

Suggested reading

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Course Outcomes:

Students will be able to understand:

1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
2. Model Curriculum of Engineering & Technology PG Courses [Volume -II] [306]
3. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
4. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

AC08 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

0 Credits (2-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course Objectives
1. To learn to achieve the highest goal happily
2. To become a person with stable mind, pleasing personality and determination
3. To awaken wisdom in students

Unit	Content	Hours
1.	Neetisatakam-Holistic development of personality • Verses- 19,20,21,22 (wisdom) • Verses- 29,31,32 (pride & heroism) • Verses- 26,28,63,65 (virtue) • Verses- 52,53,59 (dont's) • Verses- 71,73,75,78 (do's)	8
2.	• Approach to day to day work and duties. • Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48, • Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, • Chapter 18-Verses 45, 46, 48.	8
3.	• Statements of basic knowledge. • Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 • Chapter 12 -Verses 13, 14, 15, 16,17, 18 • Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, • Chapter 4-Verses 18, 38,39 • Chapter18 – Verses 37,38,63	8

Suggested reading
1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.

Course Outcomes
Students will be able to
1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students.

3OE01 BUSINESS ANALYTICS

3 Credits (3-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course objective

1. Understand the role of business analytics within an organization.
2. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision-making tools/Operations research techniques.
6. Mange business process using analytical and management tools.
7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

LECTURE WITH BREAKUP	**NO. OF LECTURES**
Unit1: Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.	9
Unit 2: Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.	8
Unit 3: Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.	9
Unit 4: Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical	10

Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series withSeasonality, Regression Forecasting with Casual Variables, Selecting AppropriateForecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.	
Unit 5: Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.	8
Unit 6: Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.	4

COURSE OUTCOMES

1. Students will demonstrate knowledge of data analytics.
2. Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Students will demonstrate the ability to use technical skills in predicative and prescriptive modelling to support business decision-making.
4. Students will demonstrate the ability to translate data into clear, actionable insights.

Reference:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education.

3OE02 INDUSTRIAL SAFETY

3 Credits (3-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Unit-I: Industrial safety: Accident, causes, types, results and control, mechanical and electricalhazards, types, causes and preventive steps/procedure, describe salient points of factories act
1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.
Unit-II: Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department,
Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost
& its relation with replacement economy, Service life of equipment.
Unit-III: Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.
Unit-IV: Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.
Unit-V: Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical Model motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Reference:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London

3OE03 OPERATIONS RESEARCH

3 Credits (3-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course Outcomes: At the end of the course, the student should be able to
1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2. Students should able to apply the concept of non-linear programming
3. Students should able to carry out sensitivity analysis
4. Student should able to model the real world problem and simulate it.

Syllabus Contents:
Unit 1:
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models
Unit 2
Formulation of a LPP - Graphical solution revised simplex method - duality theory – dual simplex method - sensitivity analysis - parametric programming
Unit 3:
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem – max flow problem - CPM/PERT
Unit 4
Scheduling and sequencing - single server and multiple server models – deterministic inventory models - Probabilistic inventory control models - Geometric Programming.
Unit 5
Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

References:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

3OE04 COST MANAGEMENT OF ENGINEERING PROJECTS

3 Credits (3-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Introduction and Overview of the Strategic Cost Management Process
Cost concepts in decision-making; relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.
Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process
Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis.
Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material
Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value- Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.
Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

References:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

3OE05 COMPOSITE MATERIALS

3 Credits (3-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

UNIT–I: INTRODUCTION: Definition – Classification and characteristics of Compositematerials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.
UNIT – II: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.
UNIT – III: Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.
UNIT–IV: Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.
UNIT – V: Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TEXT BOOKS:
1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007.

References:
1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

3OE06 WASTE TO ENERGY

3 Credits (3-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Unit-I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forestresidue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors
Unit-II: Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.
Unit-III: Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.
Unit-IV: Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.
Unit-V: Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features – Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

References:

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

3OE07 ADVANCEMENTS IN COMMUNICATION SYSTEMS

3 Credits (3-0-0)
Maximum Marks: 100
Internal Marks: 30
External Marks: 70
Time: 3 Hours

Note:
Nine questions will be set by the examiners, two from each unit and one question of short answer/objective type covering the whole syllabus, which will be compulsory. Students will have to attempt five questions in all, including one question from each unit and the compulsory question. Each question will be of 14 marks.

Course Assessment Methods: Both Continuous & Semester End Assessment

Course Objective

1. The objective of this course is to study about the advancement in communicationsystems.
2. Study about the digital communication & basic concepts of mobile communication.
3. Study of optical communication & multiplexing techniques.
4. To understand basics of navigation devices like Radar, Sonar.

Course Outcomes:

CO-1 Ability to understand about the advanced communication systems.
CO-2 Students get introduction about navigational techniques.
CO-3 Satellite is the core of modern communication. Students get the introduction about satellite by this subject.

UNIT I

The essentials of a Communication system, Amplitude modulation, Phase modulation (PM) & frequency modulation (FM), Demodulation, ASK, FSK, BPSK, QPSK, Introduction to GSM,
CDMA, Architecture of GSM, CDMA, Frequency Reuse concept, ISDN (Integrated Services digital Networks).

UNIT 2

Introduction to optical communication system: Electromagnetic spectrum used for optical communication, block diagram of optical communication system, Advantages of optical fiber communication, Optical fibers structures and their types, fiber characteristics, Basic principles oflight propagation, Total internal reflection, Acceptance angle, Numerical aperture, Optical sources, Optical Detectors, Principles of optical detection, Optical Networks, why optical Networks? , SONET/SDH, WDM optical networks.

UNIT3

Communication signal multiplexing, Time division multiplexing, Frequency division multiplexing, Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access.

UNIT 4

Block Diagram and operation of RADAR, SONAR, Simple form of Radar Equation, Pulse Repetition frequency, VSAT(data broadband satellite), MSAT (Mobile Satellite Communication technique), Sarsat (Search & Rescue satellite) & LEOs (Lower earth orbit satellite), Satellite communication with respect to Fiber Optic Communication, LANDSAT, Defense satellite Beam Acquisition, Tracking & Positioning.

Text and Reference Books:

1. Communication systems (4th edn.): Simon Haykins; John wiley& sons.
2. Electronic Communication systems: Kennedy; TMH.
3. Optical Fiber Communications: John M Senior; PHI.
4. Wireless Communications: Theodore S. Rappaport; Pearsons.
5. Introduction to Radar Systems: Merrill I. Skolnik; MGH
6. Satellite Communication: D.C. Aggarwal; Khanna.