

**CURRICULUM OF MECHANICAL ENGINEERING
RGUKT BASAR**

IV YEAR

II SEMESTER

Subject Code	Subject Name	L-T-P	C
BSBE4001	Environmental Science	4-0-0	3
	Open Elective	4-0-0	3
ME4800	Project-II	0-0-15	12
ME4000	Comprehensive Viva-II		1
	Total	8-0-15	19

Externals: 60Marks**L-T-P-C****Internals: 40Marks****4-0-0-3****Objectives:**

- To study the sources of water, floods and its impact on environment
- To know about the ecosystem and energy resource system
- To understand the Biodiversity concept and its advantages
- To study different types of pollution and its impact on environment
- To know the social and environment related issues and their preventive measures

Unit - I**Environmental studies:** Definition, scope and importance, need for public awareness.**Natural resources:** Water resources; use and over utilization of surface and ground water, Floods, drought, conflicts over water, dams-benefits and problems. Effects of modern Agriculture, fertilizer-pesticide problems, water logging and salinity.***Unit - II*****Ecosystems:** Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem(ponds, streams, lakes, rivers, oceans, estuaries).**Energy resources:** Growing energy needs renewable and non-renewable energy sources. Land resources. land as resource, land degradation, soil erosion and desertification.***Unit - III*****Biodiversity:** Genetic species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.***Unit - IV*****Environmental pollution:** Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid and liquid waste management.

Environment protection act: Air, water, forest and wild life Acts, enforcement of Environmental legislation.

Unit - V**Social Issues and the Environment:** Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology, disaster management cycle, and disaster management in India.

Suggested readings:

1. *A.K De, Environmental Chemistry, Wiley Eastern Ltd.*
2. *E.P. Odum, Fundamentals of Ecology, W.B. Saunders Co., USA.*
3. *M.N, Rao and A.K. Datta, Waste Water Treatment Oxford and IBK Publications.*
4. *Benny Joseph, Environmental Studies, Tata McGraw Hill, 2005.*
5. *V.K. Sharma, Disaster Management, National Centre for Disaster Management, IPE, Delhi, 1999.*

Reference:

1. Green Buildings Council of India, Teri Document.
2. GL. Karia and R.A. Christian, Waste Water Treatment, Concepts and Design Approach, Prentice Hall of India, 2005

BM4502

ENTREPRENEURSHIP AND NEW VENTURES

Externals: 60Marks

L-T-P-C*

Internals: 40Marks

4-0-0-3

Course Objective:

- This course enables the students to learn wide range of managerial concepts and equip them to handle the management assignment in the future.

Course Objective: This course has two basic objectives. The first is to teach effective entrepreneurial and general management practice from the perspective of the founder and stakeholders. The second is to apply the entrepreneurial perspective in order to approach business problems from a value creation framework.

Course Contents:

1. **Introduction to Entrepreneurship:** Learning objectives, Entrepreneurship in Indian Scenario and Future prospects, Emerging economies, Entrepreneurial traits, motivation and leadership (7Modules)
2. **Entrepreneurial Process:** Opportunity Identification, Idea Generation and Evaluation. (6 Modules)
3. **Business Model:** Business Plan, Business Models (Creating a business model with technology differentiators) (5 Modules)
4. **Financing Venture:** Funding, Valuation of a new company, Marketing, Company Growth, Acquisitions and Exit Strategies. (6 Modules)
5. **Building the Team and IPR:** Launching and managing venture, Human resource aspects. Intellectual Property and Corporate Law. (12 Modules)

Suggested Reference Books:

1. Kuratko & Hodgetts, *Entrepreneurship-Theory, Process Practice*, Thompson South-Western Publication, (2008).
2. Holt, *Entrepreneurship – New Venture Creation*, PHI Publication, (1992).
3. Kawasaki, *The Art of the Start*, Portfolio Publication, (2004).
4. Lusk & Harrison, *The Mouse Driver Chronicles: The True-Life Adventures of Two First-Time Entrepreneurs*, Perseus Books Group, (2002).
5. Dorf & Byers, *Technology Ventures: From Idea to Enterprise*, McGraw Hill Publication, (2010).
6. Kaplan, *Startup: A Silicon Valley Adventure*, Penguin Books, (2001).

BM4503

INTELLECTUAL PROPERTY RIGHTS

Externals: 60Marks

L-T-P-C*

Internals: 40Marks

4-0-0-3

Course Objective:

- This course enables the students to learn wide range of managerial concepts and equip them to handle the management assignment in the future.

Course Objective: This course aims at helping the students to learn legalities of intellectual property to avoid plagiarism and other IPR relates crimes like copyright infringements.

Course Contents:

1. **Introduction to IPR:** Meaning of Intellectual Property, Nature of I.P, Protection of IP Rights, Kinds of I.P rights, International Conventions on Intellectual Property Rights- patent treaty 1970, GATT1994, TRIPS &TRIMS, International Organisation for Protection of IPR-WTO, WIPRO, UNESCO.
2. **Patent Rights:** Meaning of patent, commercial significance, Obtaining patent, patentable subject, rights and obligations of patentee, Registration of patents, compulsory licensing and licenses of rights, revocation.
3. **Industrial designs:** Definitions of Designs, Registration of Designs, rights and duties of proprietor of designs, piracy of registered designs.
4. **Introduction and significance of Trademarks:** Meaning of Trademark, purpose of protecting Trademarks, Registered Trademarks, procedure, passing off, assignment and licensing of Trademarks, Infringement of Trademarks.
5. **Nature of scope of Copy Right:** Subject matter of Copy Right, Right conferred by copyright publication, Board- Casting and telecasting, Computer programme, database right, Assignment and Transmission of Copyright, Infringement of copy right.

Suggested Readings:

1. Cornish.W.R, "Intellectual Property Patents", Copy Right and Trademarks and Allied rights, Sweet&Maxwell 1993.
2. P. Narayanan: Intellectual Property Law, Eastern Law House, 2nd edn 1997.
3. Roy Chowdhary, S.K. & Other:Law of Trademark, Copyrights, Patents and Designs, Kamal Law House, 1999.
4. Dr. G.B. Reddy,Intellectual Property Rights and the Law 5th Ed. 2005 GogiaLaw Agency.
5. B.L. Wadhera: Intellectual Property Law, Universal Publishers, 2nd Ed. 2000.

BSBE 4501

SUSTAINABLE TECHNOLOGIES

Externals: 60 Marks

L-T-P-C

Internals: 40 Marks

4-0-0-3

Learning objectives: To give an overview of existing technologies and their associated problems. The main objective of the course is to stress on the need of innovation in development of sustainable technologies.

Learning outcome: This paper sets out to discuss the commonalities that can be found for sustainable development. The commonalities include systemic or holistic thinking, the integration of different perspectives, skills such as critical thinking, diverse attitudes and values. Student will get the knowledge to resolve the environmental problems of the planet, work towards community-oriented problems with coherent and inferential problem solving skills.

UNIT 1: DRAW BACKS OF CURRENT TECHNOLOGIES

Environmental degradation, financial constraints, social issues with automation in technology, extinction of fossil fuels, risks involved in operations. Global environmental issues- Resource degradation, Climate change (Carbon credits and carbon trading, carbon foot print), Global warming, Ozone layer depletion, Regional and Local Environmental Issues.

UNIT 2: ENVIRONMENT REMEDIATION

Environment Impact Assessment (EIA) - Procedures of EIA in India, Physical and Chemical technologies for reclamation, Need for ecosystem restoration, Bioremediation.

Alternative Hierarchy Process (AHP), Selection of best technology using AHP, Alternative resources and technologies, resource recovery from waste, energy recovery from waste, Sustainable Development vs Environmental Engineering - Energy Issues.

UNIT 3: SUSTAINABLE TECHNOLOGIES

Sustainability - Introduction, Need and concept of sustainability; People, planet and profit; Social, environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Green technologies.

UNIT 4: BIOMIMICRY

Defining biomimicry, why biomimicry matters? Biomimicry examples - Bioplastics, biomaterials, bioluminescence for LED's, neural networks, swarm intelligence, aerodynamics for automobile engineering, DNA computing.

UNIT 5: BIOLOGICAL RESOURCES FOR SUSTAINABILITY

Organic Farming for sustainable agriculture, Microbial leaching of low grade mineral ores, Bioelectricity (Microbial fuel cells), Biomagnetism (for therapy), Biofuels (for energy), Microbial engineering for cleaning environmental pollution, biosynthesis of industrial products.

Reference:

1. *Perspectives on Sustainable Technology*- M. Rafiqul Islam
2. *Sustainable Energy Consumption and Society*- David L. Goldblatt
3. *Sustainable development (energy, engineering and technologies, manufacturing and environment)* - Chaouki Ghenai
4. *Sustainability and Environmental Impact of Renewable Energy Sources* - R. E. Hester, R. M. Harrison
5. *Sustainable Natural Resources Management* - Prof. Abiud Kaswamila.
6. *Sustainable Communities Design Handbook* - Woodrow W. Clark
7. *Handbook of Bioplastics and Biocomposites Engineering Applications* - Srikanth Pilla
8. *Modeling & Imaging of Bioelectrical Activity: Principles and Applications (Bioelectric Engineering)* - Bin He
9. *Handbook of Swarm Intelligence: Concepts, Principles and Applications* – Yuhui Shi, Meng-Hiot Lim, Bijaya Ketan Panigrahi.
10. *DNA Computing and Molecular Programming* - DNA 16 – Yasubumi Sakakibara, Yongli Mi
11. Allen, D. T. and Shonnard, D. R., *Sustainability Engineering: Concepts, Design and Case Studies*, Prentice Hall.
12. Bradley, A.S; Adebayo, A.O., Maria, P. *Engineering applications in sustainable design and development*, Cengage Learning .
13. *Environment Impact Assessment Guidelines, Notification of Government of India*, 2006
14. Mackenthun, K.M., *Basic Concepts in Environmental Management*, Lewis Publication, London, 1998 .
15. *ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System*

16. Ni bin Chang, *Systems Analysis for Sustainable Engineering: Theory and Applications*, McGraw-Hill Professional.

17. Twidell, J. W. and Weir, A. D., *Renewable Energy Resources*, English Language Book Society (ELBS).

18. Purohit, S. S., *Green Technology - An approach for sustainable environment*, Agrobios publication.

19. *Biomimicry: Innovation Inspired by Nature* by Janine Benyus.

BSBE 4503

BIOMATERIALS

Externals: 60 Marks

L-T-P-C

Internals: 40 Marks

3-0-0-3

Learning Objectives:

After successfully completing this course, students will be able to:

1. Understand the fundamental principals in biomedical engineering, material science and chemistry, and how they contribute to biomaterial development and performance.
2. Understand the material selection and structure-function relationships
3. Lists the different strategies to modify and/or design materials that are biocompatible.

Learning Outcomes

On completion of this course students should be able to:

- Demonstrate in-depth knowledge of the mechanical and biological properties of both natural and synthetic biomaterials and thereby implicate its behavior with biological system.
- Describe the role of adsorbed proteins and cells in the tissue response to biomaterials.
- Demonstrate an understanding of the host response to orthopedic biomaterials and be able to compare the responses to different materials.
- Describe the methods of testing for biomaterials biocompatibility.
- Distinguish the events that lead to the degradation of materials in the biological environment.
- Demonstrate an understanding of implant failure from a biological perspective.
- Appreciate the complex mechanical and biological interactions between biomaterials and biological systems
- Demonstrate an in-depth knowledge of the application of biomaterials (both natural and synthetic) in orthopedics, dental, cardiovascular, drug delivery and various system repairing activities of a human body.

UNIT 1. INTRODUCTION TO THE BACKGROUND CONCEPTS OF BIOLOGY, BIOCHEMISTRY AND MEDICINE.

Concepts of cells, proteins and their interaction with the biomaterial, Structure and properties of different classes of biomaterials; Interactions of materials with the human body; Criteria for selection of biomaterials for specific medical applications, Concepts of Biocompatibility, mechanical properties of biomaterials, corrosion and biodegradation, evaluation of biomaterials.

UNIT 2. METALS AND ITS COMPOSITES.

Surface interaction with the cells; Classes of metals & metal composites; Applications of metals & metal composites; Biocompatibility testing's and evaluation of metals and its composites.

UNIT 3. CERAMICS AND ITS COMPOSITES.

Surface interaction with the host cells; Classes of Ceramics and its composites; Applications of Ceramics and its composites; Biocompatibility testing's and evaluation of Ceramics and its composites.

UNIT 4. POLYMERS AND ITS COMPOSITES.

Surface interaction with the cells, classes of polymers and its composites; Applications of polymers and its composites; Biocompatibility testing's and evaluation of polymers and its composites.

UNIT 5. BIOMEDICAL APPLICATIONS OF BIO MATERIALS.

Nanostructure biomaterials, Orthopedic implants, dental implants, vascular grafts, ocular materials, drug delivery carriers, introduction to tissue regeneration scaffolds.

.Texts & References

- Ratner B, Hoffman A. et al. Biomaterials science: An introduction to materials in medicine, Academic Press, 2004
- Fredrick H. Silver: Biomaterials, Medical Devices & Tissue Engineering: An integrated approach. Chapman & Hall, 1994

CH4504

COMPUTATIONAL FLUID DYNAMICS

Externals: 60 Marks

CInternals: 40 Marks

L-T-P-

4-0-0-3

Objective:

- To be able to apply the conservation laws to fluids in motion under different conditions
- To learn modeling of fluid flow under different conditions
- To learn how to convert differential equations to difference equations and to learn grid generation methods
- To simulate the model

Unit-1 Conservation Laws And Turbulence Models

Governing equations of fluid flow and heat transfer –mass conservation, momentum and energy equation, differential and integral forms, conservation and non-conservation form.

Characteristics of turbulent flows, time averaged Navier Stokes equations, turbulence models-one and two equation, Reynolds stress, LES and DNS

Unit-2 Finite Difference Approximation

Mathematical behaviour of PDE, finite difference operators, basic aspects of discretization by FDM, explicit and implicit methods, error and stability analysis

Unit-3 Finite Volume Method

Diffusion problems – explicit and implicit time integration; Convection-diffusion problems – properties of discretisation schemes, central, upwind, hybrid, QUICK schemes; Solution of discretised equations.

Unit-4 Flow Field Computation

Pressure velocity coupling, staggered grid, SIMPLE algorithm, PISO algorithm for steady and unsteady flows

Unit-5 Grid Generation

Physical aspects, simple and multiple connected regions, grid generation by PDE solution, grid generation by algebraic mapping.

Text Books:

1. Computational Fluid Dynamics: The Basics with Applications, Anderson, J. D., McGraw-Hill, 1995.
2. Computational Techniques for Fluid Dynamics, Fletcher, C. A. J., Springer Verlag, 1997.

References:

1. An Introduction to Computational Fluid Dynamics: The Finite Volume Method, Versteeg, H.K. and Malalasekera, W., Pearson Education Ltd., 2007.
2. Computational Fluid Dynamics, Chung T.J, Cambridge University Press 2003.
3. Computational Fluid Flow and Heat Transfer, Muralidhar, K., and Sundararajan, T., Narosa Publishing House, New Delhi, 2001.
4. Numerical heat transfer fluid flow, Subas, V. Patankar Hemisphere Publishing Corporation, 1980.

BM4501

FOUNDATIONS OF MANAGEMENT

Externals: 60Marks

L-T-P-C*

Internals: 40Marks

4-0-0-3

Course Objective:

- This course enables the students to learn wide range of managerial concepts and equip them to handle the management assignment in the future.

Course Contents:

1. **Development of Management Thought:** Learning objectives, Concept of management, Scientific Management-Taylor, Henry Fayol contributions, Human Relations approach-Hawthorne experiments, Approaches to Management, Ethics in management.
2. **Functions of Management:** Management Processes and function: Nature and description of management process, Managerial functions: Planning, Organizing, Directing, Coordinating and Controlling. Communication process, Theories of motivation and leadership, (14 Modules)
3. **Human Resource Management:** Nature and Scope of Human Resource Management, Functions of HRM, Industrial Relations. (7 Modules)
4. **Marketing Management:** Marketing Environment, Consumer Markets and Buyer Behaviour, Segmentation, NPD, PLC, Marketing Mix (4Ps), Channels of Distribution. Advertising and Sales Promotion, Personal selling, Public relations. (8 Modules)
5. **Production/Operation Management:** Planning and Design of Production and Operation Systems, Facilities Planning, Location, Layout and Movement of Materials, Materials Management and Inventory Control, Maintenance management, Statistical Quality Control, TQM and ISO Certification. (7 Modules)

Suggested Reference Books:

1. Weirich, Koontz & Aryasri, *Principles of Management*, TMH, New Delhi, (2004).
2. Paul Heresy & Ken Blanchard, *Management and Organizational behavior*, PHI, New Delhi, (1995)
3. Kotler Philip, *Marketing Management*, Prentice Hall of India (1997).
4. Luthans Fred, *Human Resource Management*, McGraw Hill, (1997).
5. Stephen Robbins, *Organizational Behaviour Concepts, Controversies and Applications*.

CODE: ME4000

COMPREHENSIVE VIVA-II

Scheme of External Exam
Credits

: 50 Marks
: 1

Students are assessed in the courses they have undergone till the completion of that academic year. They are asked to comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills.

There are no sessional marks. The end examination shall be conducted by a committee consisting of an External examiner, Head of the department and two senior faculty members. The evaluation is purely external and it carries marks 50.