(CH-15001) Applied Chemistry

Syllabus for FYBTECH

Teaching Scheme: Evaluation Scheme:

Lectures: 3hrs / week T1-20M, T2-20M

Practical: 2hrs/week End-SemExam:60M

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Objectives of the course

- To emphasize the relevance of fundamentals and applications of chemical sciences in the field of engineering.
- To get introduce with the advanced materials used in high technology
- To understand attractive & feasible energy conversion technology that is non polluting
- To know various parameters needed to select, investigate & design the engineering materials

Giving hands on experience of various analytical techniques and associated calculations.

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Unit 1: Water Technology (6 Hrs)

Structure and Properties of water, Water quality parameters- heavy metal, microbial impurities, dissolved salts and their consequences (BIS and WHO standards), Determination of hardness by EDTA method, chloride content, Alkalinity of water and its significance, Water treatment for civic applications, Problems associated with use of hard water in Boiler and its treatment

Unit 2: Corrosion and corrosion control (6Hrs)

Corrosion- Atmospheric corrosion-mechanism, Wet corrosion-mechanism, Electrochemical and galvanic Series, Typical Electrochemical corrosion like (Galvanic, Pitting, Inter-granular, Waterline) Factors affecting corrosion-nature of metal, nature of environment, Methods of prevention of Corrosion-cathodic and anodic protection ,Metallic coatings, hard coatings.

Unit 3: Absorption spectroscopy (7 hrs)

An overview of Electromagnetic spectrum, various regions, energies and interactions with matter . Fundamentals of Spectroscopy, Principles and applications of UV-visible, IR and microwave spectroscopy. Atomic Absorption Spectroscopy

Unit4: Fuels and combustion (8 Hrs)

Fuels: Definition, classification of conventional fuels, calorific value and its units, Determination of calorific value of solid and liquid fuels -Bomb calorimeter – working. Solid fuels : Coal, proximate and ultimate analysis of coal. Liquid fuels: refining of petroleum, Knocking, Octane number of petrol, cetane number of diesel. Air to fuel ratio, Vehicular emission, catalytic converter significance of PUC certification,

Combustion: Chemical reactions, Calculation on air requirement for combustion – numerical

Unit 5: Polymers (7Hrs)

Basic terminology, Characteristics and Properties of polymers like molecular wt., crystallinity, phase transformation, dissolution. Classes of polymers- commodity plastics, resin, elastomer, fiber, adhesive, foam etc. (any 5 examples with synthesis, properties and applications) . Specialty polymers conducting polymer, silicon base polymer, biodegradable polymers.

Unit 6: Nanomaterials (7Hrs)

Introduction, classes of nano materials- Carbon base nano materials (graphene, graphene oxide, CNT), semiconducting nanoparticles (ZnO,SnO2), metal nano clusters(Ag, Pt, Pd, Rh), quantum nano structures, Synthesis by physical and chemical processes: 2 each. Applications of nanomaterials in Catalysis, Electronics, Communication, Medicines, Composites, Energy sciences

List of Recommended Books

1. A textbook of Engineering Chemistry: Jain and Jain, Dhanpatrai Publication.

2. Instrumental Methods of Chemical analysis, Willard Dean, Merrittee, Tata MacGrow Hill Limited.
3. A textbook of Engineering Chemistry: S. S. Dara, S. Chand Publication 2010 edn.
4. A textbook of Engineering Chemistry: Shashi Chawla, Dhanpatrai Publication.
5. Polymer Science: V.R.Gowariker, New Age International Publication
6. Introduction to Nanotechnology: Charles P. Poole, Frank J. Owens.

LIST OF EXPERIMENTS

Teaching Scheme: **Evaluation Scheme:**

Practical: 2hrs/week **Total Marks: 100 M**

CCE: 70M, ESE: 30M

1. **Preparation and Standardization of Analytical Reagents**
2. **Determination of temporary and permanent hardness of water sample by EDTA method.**
3. **Determination of total alkalinity of water sample.**
4. **Available chlorine in bleaching powder**
5. **pH-metric titration of Acid/Base**
6. **Colorimetric determination of concentration of given inorganic sample.**
7. **Demonstration of UV_VIS spectrophotometer**
8. **Determination of calorific value of a fuel using Bomb's calorimeter**
9. **Proximate Analysis of coal**
10. **Determination of molecular weight of a polymer using Ostwald's viscometer.**
11. **Determination of chloride content of water by Mohr's method**

Lecture wise break up: Chemistry Nanomaterials

Unit 6	Introduction to nanotechnology	Page nos.
Nanomaterials	Introduction to nano materials ,scale, historical account on development of nano materials, size dependence of properties, bulk to nano transition	8
	Classes of nano materials , carbon base- clusters CNTs, graphene, graphene oxide	103
	Metal nano clusters - e.g. silver, Pt, Pd, Rh, nano particles as suspension	
	Methods of synthesis- RF plazma, Chemical method, Thermolysis, Pulsed laser	97
	Quantum nano structures - dots, wires, surfaces - size and dimensionality effects-	226
	Application - catalyst, electronics, communication, medicines, energy devices	

CH15002 Applied Chemistry Laboratory

LIST OF EXPERIMENTS

Teaching Scheme: **Evaluation Scheme:**

Practical: 2hrs/week **Total Marks: 100 M**

CCE: 70M, ESE: 30M

1. **Preparation and Standardization of Analytical Reagents**
2. **Determination of temporary and permanent hardness of water sample by EDTA method.**
3. **Determination of total alkalinity of water sample.**
4. **Available chlorine in bleaching powder**
5. **pH-metric titration of Acid/Base**
6. **Colorimetric determination of concentration of given inorganic sample.**
7. **Demonstration of UV_VIS spectrophotometer**
8. **Determination of calorific value of a fuel using Bomb's calorimeter**
9. **Proximate Analysis of coal**
10. **Determination of molecular weight of a polymer using Ostwald's viscometer.**
11. **Determination of chloride content of water by Mohr's method**

College of Engineering Pune (COEP)

Department of Applied Sciences

Syllabus for Professional Communication (HSMC-15001)

Introduction:

With the rapidly growing importance of communication, one needs to be competent enough to express himself/herself effectively. It is often said that hard skills will get you an interview but you need soft skills to get (and keep) the job. One of the important elements of soft skills include the ability to communicate effectively. Communication skills are essential for engineers who aspire to carry out their professional practice in the global arena. Engineering communication skills constitute several core elements such as the fluency in the English language with command over the four basic skills viz. listenig, speaking, reading and writing.

Course Objectives:

1. To help students boost their confidence and learn the language and show awareness of the appropriate format and present their ideas in rational and logical manner.
2. To enhance their linguistic competence and grasp intricacies involved in the development of basic language skills namely listening, speaking, reading and writing
3. To help students understand the basic concept of communication, its process, stages, channels, and its value/usage in business/technical field.
3. To apply language principles/skills for effective communication in an accent widely understood across the globe.
4. To make them aware of industry requirements and to equip them with employability skills

Course Outcomes:

a. Students will be able to attempt tasks by using functional grammar and vocabulary effectively.
b. Students will be able to reflect on basic language skills – listening, speaking, reading and writing and use them in the most appropriate manner.
c. Students will be able to understand the importance and usage of effective communication and apply effectively in various fields.
d. Students will be able to reproduce their understanding of concepts / principles of communication skills as per global requirements.
e. Students will be able to present themselves well in front of large audience on a variety of situations related to group communication and presentation in a relevant scenario. Moreover, they will get the knack for structured conversation to make their point of views clear to the listeners.

Teaching Scheme	Lecture	Tutorial	Practical	Total
Credit	**1**	**0**	**1**	**2**
Hours/week	**1**	**0**	**4**	**5**
Marks	**T1: 30**	**T2: 30**	**ESE: 40**	**100**

Unit No.	Details
Unit 1	Communication as a skill: types of communication, barriers to communication, effective communication
Unit 2	Foundation of language: grammaticality and acceptability, word power, accuracy and appropriateness
Unit 3	Listening: nature of listening, stages of listening (pre, while and post)
Unit 4	Speaking: pronunciation, stress, intonation and pauses, formal and informal expressions, conversation skills, general discussions, presentation skills, business etiquette
Unit 5	Reading: silent reading, reading aloud, reading for details, reading for gist, reading for pleasure, reading for study, reading between and beyond the lines
Unit 6	Writing: nature of writing, stages of writing (pre, while and post), qualities of effective writing, what makes writing poor, the what, how and why of writing, drafting, summarizing, letter writing, writing reports

Teaching Methodology:

- A proficiency test will be conducted to determine the levels of the candidates.
- The course will be conducted through an activity-based learning approach.
- Lectures will be taken in the classroom and practicals in the language lab.
- Cumulative Continuous Assessment (CCA) will be conducted during the course.
- An end-test will be conducted to assess their communicative competence.

Reference Books:

Communication Skills for Engineers by S. Mishra & C. Muralikrishna (Pearson)

Communication Skills for Technical Students by T.M. Farhathullah (Orient Longman)

Written Communication in English by Saran Freeman (Orient Longman)

Essential English Grammar (Elementary & Intermediate) Raymond Murphy (CUP)

Communication for Business: A Practical Approach by Shirley Tailor (Longman)

Developing Communication Skills by Krishna Mohan & Meera Banerji (Macmillan)

Business Correspondence and Report Writing, R. C. Sharma & Krishna Mohan (Tata McGraw Hill)

Websites:

http://www.englishpage.com

http://www.english-4u.de/

http://www.nonstopenglish.com/

http://www.business-english.com

http://www.breakingnewsenglish.com/

http://www.elllo.org/

http://www.fonetiks.org

College of Engineering, Pune
Science of Living Systems (ML 201)
Second Year B. Tech. Program

Teaching Scheme
Lectures : 3 lectures/week

Examination Scheme
T1-**20** (Classroom activity),T2-**20** (Assignment/s)
Semester End Examination-**60**

Objectives: To make students conversant with basic Biology regarding the life processes. To impart knowledge about the common corridors of biology and engineering as biologically inspired technologies like designs in nature, bioenergetics, bioprocesses, biomaterials, biomechanics, bioimaging, bioinformatics, bioinstrumentation etc. To introduce recent trends in biology viz. genetic & tissue engineering, stem cell engineering, bio and nanotechnology etc. with the objective of appreciating engineering principles in biological systems.

Course Education Objectives

1. To introduce an interdisciplinary approach of biology and engineering
2. To understand biologically inspired technologies
3. To pursue the studies in engineering having application in biological, medical, environmental & agricultural fields

Course Objectives:

a. Knowing basic concepts of biology with their application in more meaningful way
b. Understanding natural biological processes in view of increasing efficiency of engineering
c. Discussion on biological solutions resolving problems caused by technical revolution
d. Introduction of concept of designs and environmental engineering to Civil engineers
e. Introduction of biomaterials and nanomaterials to Metallurgy and Material Engineering.
f. Introduction of biomechanics to Mechanical Engineering.
g. Introduction of cell to cell communication and biosensors to Electronics and Telecommunication Engineering.
h. Introduction of bioinformatics and computational biology to Computer Science and Information Technology.
i. Introduction of biomedical instrumentation and bioimaging (ECG/EEG/CT Scan etc.) to Instrumentation & Control Technology and Electrical Engineering.
j. Introduction of interdisciplinary topics like energy transduction, cellular evolution, genetic, tissue and chemical engineering.

Unit 1: Understanding Basics (6L)

1. Engineering perspectives of biological sciences: Where engineering meets biology and where biology meets engineering. Biology as an integrated Science; Case studies on integrating biology with engineering.
2. Biopolymers and macromolecules – Structure and Function: Organic and inorganic molecules; Unique Properties of Carbon; Carbohydrates, Amino Acids and proteins, Lipids, Nucleic Acids, Vitamins and Minerals; The Rise of Living Systems.
3. Levels of organization of life : Cell as basic unit of life, prokaryotic and eukaryotic cells, microbes, plant and animal cells; Cell organelles – structure and function; Levels of organization of life - tissues, organs, systems and organism.

Unit 2: Biological Processes and Bioenergetics (6L)

1. **Energy Dynamics in Biology –**
    a) Photosynthesis and energy assimilation: aerobic and anaerobic systems. Applications
    b) Respiration and Electron Transport Chain: Mitochondria and respiration, ATP generation.
2. **Bioenergetics:** Thermodynamic principles applied to biology, negative entropy changes in biological systems, Free Energy, Chemical Equilibrium;
3. **Optimization of biological functions**: Metabolic networks; anabolism and catabolism; flux analysis (MATLAB).

Unit 3: Living Systems (6L)

1. **Transport Phenomena in Biological Systems:** Membrane channels and ion channels; Fluid flow and mass transfer
    a. In plants: Xylem and Phloem
    b. In animals: Blood and Lymph
    c. Transport of molecules and gases (Oxygen and Carbon dioxide); Heat Transport - Body temperature regulation.

2. **Communication:** Cell junctions, Cell-cell communications – cell signaling, Hormones, Pheromones; Chemotaxis. Communication in living systems by photo, bio, chemotactic methods.
3. **Defense mechanisms in plants and animals:**
    a. In plants: Herbivory, secondary metabolites.
    b. In animals: Innate and Adaptive immune systems.

Unit 4: Techniques and Devices (6L)

1. **Genetic Code** - Expression and Transmission of Genetic Information, The concept of DNA cloning; Mechanisms of Enzyme Action.
2. **Techniques for optimization:**
    a. At molecular level: Genetic Code and protein synthesis, DNA replication, RDT, DNA hybridization, Colony Hybrids, PCR, DNA microarray,
    b. At cell level: Hybridoma technology,
    c. At tissue level: Plant Tissue Culture, Animal Tissue Culture and Microbial Culture techniques; Tissue Engineering.

3. **Instrumental Methods of analysis** – A case study of protein purification and characterization: Principles and types of microscopy and spectroscopy, Chromatography, electrophoresis, diffusion, centrifugation, light scattering.

Unit 5: Discovery and Innovation (6L)

1. **Current trends and advances** in cell and molecular biology
2. **Landmark Discoveries**: Landmark discoveries in the field of Molecular Biology, Cell Biology and Genetics.
3. **Nanobiotechnology:** Micro-/Nanotechnologies for Interfacing Live Cells; Nanotechnology in Medicine – Diagnostics and Therapy; Biosensors; Nanotechnology in Agriculture; Biomemetics.
4. **Biomemetics:** Nature inspired processes applicable to the field of Engineering.

Unit 6: Branch-wise

Branch: Electronics and Telecommunication Engineering

Biosensors – Introduction to Biosensors, transducers, amplifiers; **Bioimaging**-Introduction to medical imaging and different medical Imaging modalities; Review of Signals and system; Electro Physiological Signal Analysis. Bio-telemetry Communication in living systems by photo, bio, chemo, tactic methods; **Diagnostic Devices**- Radiography, X-ray Computed Tomography Nuclear Medical Imaging, Ultrasound Imaging, Magnetic Resonance Imaging. **Therapeutic Devices**-Cardiac Pacemakers, Cardiac defibrillators, Surgical Diathermy, Diagnostic application of LASERs, High frequency heat therapy, Hemodialysis, Ventilators, Anesthesia machines, Automatic Drug delivery Systems, Electro Surgical units and safety.

Branch: Instrumentation and Control Engineering

Basic concepts of **Medical Instrumentation**: Generalized medical Instrumentation System, Medical Measurement constraints, Classification of Biomedical Instruments, Generalized static and dynamic characteristics, Design criteria, Commercial Medical Instrumentation Development process, Regulation of Medical Devices. **Biomedical transducers:** optical, photo- electric, electrochemical, electrical, mechanical, electromechanical and thermoelectric. **Specialty areas in Bioinstrumentation**—Confocal, Tunneling, Sequencing, FACS, PCR, MRI, CT,USG, Endoscopy, ECG; Introduction to biosensors and tissue engineering.

Branch: Mechanical Engineering

Biomechanics, Human body motion, Prosthetics; Introduction to Ergonomics; Elements of Anthropometry; Physiology, Anatomy; Mechanical Properties of Bone and Soft Tissues Rehabilitation engineering, Biomimetics; Bio Material Handling; Hand Tool Design; Human Information Processing; Applications of Principles of Biomechanics in two and three dimensional kinematics; Fundamentals of Fluid Mechanics; Introduction to bio sensors and tissue engineering.

Branch: Metallurgy and Material Science

Classification of biomaterials –Comparison of properties of some common biomaterials; Effects of physiological fluid on the properties of biomaterials; Biological responses (extra and intra vascular system) to Metallic, Ceramic and Polymeric implant materials; Introduction to bio sensors and tissue engineering. Metals & alloys, composites and their advantages used in bio-industries; Materials in bio-printing. **Tissue Engineering and cloning:**

Engineering cells, tissues and organs; Stem cells and translational medicine; Introduction to Gene Therapy; Bioengineering at molecular, cell and systems level; 3D bio-printing; Engineering Materials for Biomedical Applications.

Branch: Production Engineering and Industrial Management

Bio chemical engineering; Fermentation Technology, Bioreactors; Bio process Engineering; Use of living organisms (mostly microbes) to produce useful products. Biomechanics and ergonomics–production innovations.

Branch: Electrical Engineering

Alternative energy sources; Electrical signaling in biological system; Bioluminescence, bioelectricity, ECG.

Branch: Civil Engineering

Environmental engineering, Understanding ancient engineering. Designs in Nature; Bio radars.

Branch: Computer and Information Technology –

Principles of Bioinformatics, Computational Biology: Role of Computational Biology in Bioengineering; Genomics, Proteomics, Bioinformatics. Computational solutions to Biological Problems, Virtual systems Artificial Intelligence in Biomedical Engineering: Basics of Artificial Neural Networks.

Selected References:

1. Lodish H, Berk A, Zipursky SL, et al. (2000) Molecular Cell Biology. W. H. Freeman.
2. Lehninger, A. L., Nelson, D. L., & Cox, M. M. (2000). *Lehninger principles of biochemistry*. New York: Worth Publishers.
3. Lewin B. (2000) Genes VII. Oxford University Press..
4. Rao CNR, et.al. Chemistry of Nanomaterials: Synthesis, Properties and Applications.
5. Eggins BR. (1006) Biosensors: An Introduction. John Wiley & Sons Publishers.
6. Palsson B.O. and Bhatia S.N. (2009) Tissue Engineering. Pearson.

Professional Ethics & Human Values
Audit (S.Y.B.Tech.)

Teaching Scheme
Tutorials: 1hr/batch/week

Examination Scheme
Total Marks: 100
Continuous Evaluation

Course Education Objectives (CEO)

1. To enable self awareness in one's personality and learning essentials of everyday life skills
2. To strengthen the knowledge of ethical characteristics and human values essential at workplace
3. To overcome stressful situations effectively with the help of psychological approach

Course Outcomes (CO)

a) Students would understand their own personality by using different techniques and learn to apply these techniques in everyday life. Students would become aware of ethics and values in their life.
b) Students would understand concept of adjustment and learn to enhance interpersonal relationship.
c) Students would understand the importance of creativity and problem solving in their life and learn to solve problems in a novel way.
d) Students would be able to analyze their stress patterns and learn different ways of coping with stress.
e) Students would learn the importance of emotional intelligence to use it effectively in different situations.
f) Students would analyze themselves and understand their position with respect to the moral and ethical character needed for a successful and satisfactory work life.

Unit 1: Self Awareness and Values (4 hrs)

Understanding oneself and others; Johari Window- Concept, explanation, implementation; Goal achievement though SWOT Analysis and Time management matrix: Personal values and ethics – Types of values and their importance of values from students' perspective

Unit 2: Adjustment (3 hrs)

Adjustment- Personal & Social adjustment with reference to the interpersonal relationships at the work place, and work ethics

Unit 3: Creativity & Problem Solving (4 hrs)

Creativity- Concept, stages, measurement; Application of creativity to everyday life problems, using creativity for personal growth; Problem solving through activities, e.g.; Mind-Mapping- Concept & application

Unit 4: Stress & Coping (3 hrs)

Nature, types, causes & consequences; Anxiety & Stress; Measuring stress levels; Type A & B personality; Management of Stress- Techniques in practice

Unit 5: Emotional Intelligence & Values (4 hrs)

Concept & assessment of EI and EI in practice; Importance of Motivation; Engineering ethics

References:

1. Morgan, C.T.; King, R.A.; Weisz, J.R. & Schopler, J. (2001). Introduction to Psychology. 7th Edition. New Delhi: Tata McGraw Hill
2. Hilgard, E. R.; Atkinson, R. C. & Atkinson, R.L. (1975). Introduction to Psychology. 6th Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
3. Golman, Daniel. (1998). Working with Emotional Intelligence. Bloomsbury Publishing Plc.
4. Gogate, S. B. (2011). Human Values & Professional Ethics. Vikas Publishing: New Delhi.
5. Govindarajan, M; Natarajan, G. M. & Senthilkumar, V.S. (2013). Professional Ethics & Human Values. Prentice Hall: New Delhi
6. Fleddermann, C.B. (2011). Engineering Ethics. Pearson Education: Prentice Hall, New Jersey.
7. Jayshree Suresh, Raghavan B.S.(2016). Human Values & Professional Ethics: S Chand & Company.Pvt.Ltd: New Delhi.

[ML-21002] Environmental Studies

(Adopted from the 'Ability Enhancement of Compulsory Courses: Environmental Studies' as prescribed by the Expert Committee of University Grants Commission as per directives of Hon'ble Supreme Court)

Teaching scheme
Lectures: 1 Session/week
Assignments: 2 hours/week

Evaluation scheme
Periodic Assignments & Tests

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

- Comprehend Sustainable Development Goals for present generation
- Appreciate environmental resources, functioning of an ecosystem, significance of biodiversity and environmental challenges
- Analyze the current status of environment with respect to precautionary mechanisms and control measures
- Appreciate the role of an engineer for better tomorrow

Unit 1 **[2 Hrs]**

Multidisciplinary nature of environmental studies
Definition, scope and importance
Need for public awareness.

Unit 2 **[8 Hrs]**

Natural Resources
Renewable and non-renewable resources:
Natural resources and associated problems .
Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources : Use and over-utilization of surface and ground water,floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extractingand using mineral resources, case studies. Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies. Energy resources : Growing energy needs, renewable and non renewableenergy sources, use of alternate energy sources. Case studies. Land resources : Land as a resource, land degradation, man inducedlandslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit 3 **[6 Hrs]**

Ecosystems
Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem :-Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 4 **[8 Hrs]**

Biodiversity and its conservation

Introduction – Definition : genetic, species and ecosystem diversity, Bio geographical classification of India, Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit 5 **[8 Hrs]**

Environmental Pollution

Definition, Cause, effects and control measures of :-Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management : Causes, effects and control measures of urban andindustrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management : floods, earthquake, cyclone and landslides.

Unit 6 **[7 Hrs]**

Social Issues and the Environment

From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Case Studies, Environmental ethics : Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies, Wasteland reclamation, Consumerism and waste products. Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

Unit 7

[6 Hrs]

Human Population and the Environment

Population growth, variation among nations, Population explosion – Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

Unit 8 **[5 Hrs]**

Field work

Visit to a local area to document environmental assets river/forest/grassland/hill/mountain Visit to a local polluted site-Urban/Rural/Industrial/Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hill slopes, etc.

Reference Books

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,
- Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
- De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- Down to Earth, Centre for Science and Environment (R)
- Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
- Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society,

Bombay (R)
- Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
- Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
- Mckinney, M.L. & School, R.M. 1996. Environmental Science systems &Solutions, Web enhanced edition. 639p.
- Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
- Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
- Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
- Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
- Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
- Survey of the Environment, The Hindu (M)
- Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

Entrepreneurship Development
(T.Y.B.Tech.)

Teaching Scheme
Lectures: 1 hr/week

Examination Scheme
Total Marks: 100
Continuous Evaluation
Field Work/Assignment: 40
End Semester Exam: 60

Course Education Objectives (CEO)

1. To introduce and understand Entrepreneurship and its types
2. To understand how to evaluate risk in entrepreneurial ventures
3. To understand different type of finances available and financing methods
4. To understand marketing, digital marketing and their analytics
5. To understand detailed information about the principles, practices and tools involved in all aspects of the sales processes
6. To understand basics of operations management
7. To understand the nuances of Start-up
8. To understand how to use proven tools for transforming an idea into a product / service that creates value for others

Course Outcomes (CO)

a) Students would understand different types of Entrepreneurial ventures and would be able to discover, develop, and assess opportunities
b) Students would learn about opportunity and risk analysis
c) Students would understand the strategies for valuing your own company, and how venture capitalist and angel investors use valuations in negotiating milestones, influence and control
d) Students would understand to pick correct marketing mix and how to position the company in the market by using analytical tools
e) Students would learn how to sale themselves and the product/service and to handle objections
f) Students would get to know how organizations operates and their process matrices
g) Students will learn how start new ventures
h) Students will learn how to write winning business plans

Unit I: Market Research **(2 hrs)**

Introduction to Entrepreneurship, Profile of the Entrepreneur, Market Gap / Opportunity Analysis, Market Research Methods, Defining the Focal Market: Market Segmentation, Industry analyzing – Research / Competitive Analysis

Unit II: Types of Companies and Organizations **(2 hr)**

Company/ Organization Types, Legal Aspects, Taxation, Government Liaison, Building the Team, Mergers and Acquisitions

Unit III: Business Finance **(2 hrs)**

Shares and Stakes, Valuation, Finance Creation (Investors / Financers), Revenue Plans and Projections, Financial Ratios, Business Lifecycle, Break Even

Unit IV: Marketing **(2 hrs)**

Marketing Basics, Marketing Strategy and Brand Positioning, Plans and Execution Techniques, Marketing Analytics, Online Marketing

Unit V: Sales **(3 hrs)**

Understanding Sales, Pitching Techniques, Sales strategies, Inside Sales v/s Outside Sales, RFP

Unit VI: Operations Management **(1 hr)**

Operational Basics, Process Analysis, Productivity, Quality

Unit VII: Start-ups **(2 hrs)**

Start-up Basics, Terms, Start-up Financing, Start-up Incubation, Start-up Incubation, Getting Listed

Text Books:

1. The Startup Playbook: Secrets of the Fastest-Growing Startups From Their Founding Entrepreneurs by David Kidder
2. Creativity, Inc.: Overcoming the Unseen Forces That Stand in the Way of True Inspiration by Ed Catmull
3. True North by Bill George and Peter Sims
4. Bhargava, S. (2003). Transformational leadership: Value based management for Indian Organizations (Ed.). New Delhi: Response-Sage.
5. Cardullo, M. W. P. E. (1999). Technological entrepreneurism: Enterprise formation, financing, and growyh. England: Research Studies press Ltd.
6. Hisrich, R. D. & Peters, M. P. (2001). Entrepreneurship: Starting, developing, and managing a new enterprise (5th Ed.). New York: McGraw-Hill.

References:

1. Kanungo, R. N. (1998). Entrepreneurship and innovation: Models for development (Ed., Vol.2). New Delhi: Sage.
2. McClelland, D. C. (1961). Achieving society. Princeton
3. Van Nostrand. Verma, J. C., & Singh, G. (2002). Small business and industry: A handbook for entrepreneurs. New Delhi: Response-Sage.
4. Richard A Brealy & Steward C Myres. Principles of Corporate Finance, McGraw Hills, 7th Edn,2004
5. Prasanna Chandra, Financial Management: Theory and Practice, Tata McGraw Hills, 6th Edn, 2004
6. I M Pandey, Financial Management, Vikas Publishing, 9th Edn, 2004
7. Aswath Damodaran, Corporate Finance-Theory and Practice , John Wiley & Sons, 1997

8. I.M. Pandey & Ramesh Bhat, "Cases in Financial Management", Tata McGraw-Hill, New Delhi.
9. Horowitch (ED), Technology in the modern Corporation: A Strategic perspective, Pergamon Press, 1986.
10. M. Dodgson (ED), Technology and the firm: Strategies, management 7 Public Policy, Longman, Harlow, 1989

Created by Amit Janorikar

ML-17001–CONSTITUTION OF INDIA

Teaching Scheme:-
Lectures: 1 hr/week

Evaluation Scheme-
Continuous evaluation-
Assignments/Presentations/
Test

Course Outcomes

Student will be able to understand

a. how India has come up with a Constitution which is the combination of the positive aspects of other Constitutions.
b. the interpretation of the Preamble.
c. the basics of governance of our nation.
d. the different aspects covered under the different important Articles.
e. the basic law and its interpretation. Understand the important amendments which took place and their effects.
f. our Union and State Executive better.
g. the basic that along with enjoying the rights one needs to fulfill one's duties.
h. and gain confidence on our Constitution by knowing it better.

Unit 1 **(02 hrs)**

Understanding the concept 'Rule of Law '
Meaning and history of Constitution.
Understanding the concept of Human Rights and Fundamental Rights.

Unit 2 **(03 hrs)**

Introduction to The Constitution of India, understanding its objects. Preamble to the constitution of India.

Unit 3 **(02hrs)**

Fundamental rights under Part – III, exercise of the Rights, limitations and important cases.

Unit 4 **(02hrs)**

Fundamental duties & their significance.
Relevance of Directive principles of State Policy.

Unit 5 **(02hrs)**

Legislative, Executive & Judiciary (Union and State Level)
Prerogative Writs.

Unit 6 **(02hrs)**

Constitutional Provisions for Scheduled Castes, Scheduled Tribes, & Backward classes.

Constitutional Provisions for Women & Children

Unit 7 **(02hrs)**

Emergency Provisions.

Electoral procedure in India

Amendment procedure and few important Constitutional Amendments

Text Books

- Introduction to the Constitution of India by Durga Das Basu (Students Edn.) Prentice – Hall EEE, 19th/20th Edn..
- Engineering Ethics by Charles E.Haries, Michael. S.Pritchard and Michael J.Robins Thompson Asia,.

Reference Books

- An Introduction to Constitution of India by M.V. Pylee, Vikas Publishing.

(AS (ILE)-17002) Finance for Engineers –I

Teaching Scheme:

Lectures: 2 Hrs/week

Examination Scheme:

T1 (Assignment): 20 marks

T2 (Written Test): 20 marks End Semester Exam: 60 marks

Course Outcomes:

Students will be able to-

1. To understand the importance of financial literacy.
2. To understand the basics of accounting & accounting principles.
3. To analyze & solve the problems based on the above concepts.

Unit I: Accounting, Cost accounting & Management accounting, Various types of business entities, Accounting principles, postulates & meaning of accounting standards, Accounting cycle, Capital and revenue, Revenue, Expenses, Gains & Losses, Types of accounts & their rules, Journal Entries

Unit II: Create ledger, Preparation of Trial Balance, Finalizations, Preparation of Trading & Profit & Loss account, Understanding of Assets & Liabilities, Concept of Balance Sheet, Preparation of Balance sheet

Textbooks:

- “Financial Accounting”, Dr. Kaustubh Sontakke [Himalaya Publishing House]

Reference Books:

- Accounting Theory & Practice Prof Jawahar Lal [Himalaya Publishing House]

ENGINEERING ECONOMICS-I
ILOE (T.Y.B.Tech.)

Teaching Scheme
Lectures: 2hrs/week

Examination Scheme
Total Marks: 100
Continuous Evaluation
Field Work/Assignment: 40
End Semester Exam: 60

Course Education Objectives (CEO)

1. To introduce the essentials of economics
2. To increase economic knowledge and how the markets work
3. To understand competition market and the basis
4. To understand how International Markets work and their principles
5. To understand how start-ups work

Course Outcomes (CO)

a) Students would understand the nature of markets and competition
b) Students would learn about Basic Concepts of Economics, Micro and Macro
c) Students would understand the importance of how industries behave
d) Students would understand the basis in our day to day life to gain personal financial control
e) Students would learn about start-up culture and economics
f) Students would get to know finance generation and funding rounds

Unit I: Basic Concepts of Economics (6 hrs)

Definitions, Overview of Micro and Macro Economics, Explanation of theories of demand, supply and market equilibrium and Economics Basics – Cost, efficiency and scarcity**,** Opportunity Cost

Unit II: Micro Economics (8 hrs)

Differences and Comparison, Theories of Utility and Consumers Choice, Competition and Market Structures, Markets and Prices, Market Failures, Income Distribution and Role of Government

Unit III: Macro Economics
(6 hrs)

Aggregate Demand and Supply, Economic Growth and Business Cycles, The role of the Nation in economic activity, New Economic Policy in India, Fiscal Policy, GDP and Inflation, Consumption, savings and investments, Commercial and Central banking

Unit IV: **Industrial Economics** **(8 hrs)**

Behaviour of firms: Strategies with regard to entry, pricing, advertising, and R & D and innovation. The development of Firms and Market and Industrial Structure: Stochastic models of firm growth, and market structure, inter-industry differences in growth rate variance, economies of scale, technical change, mergers and market concentration. Development of Competitive capabilities: Role of Technology and Skills, FDI and Technology Transfer, Technological Spillovers, Globalization and Technology Intermediation.

Text Books:

1. Baumol, William J., Economic Theory and Operations Analysis, [Prentice Hall India Ltd.] Fourth Edition, 1985.
2. Sloman, John H., Economics [Prentice Hall India Ltd.] Second Edition, 1994.
3. Varian, Hal, ` Intermediate Microeconomics: A Modern Approach, Fifth Edition [Norton, 1999].
4. P.A. Samuelson & W.D. Nordhaus, Economics, McGraw Hill, New York, 1995.
5. Koutsoyiannis, Modern Microeconomics, Macmillan, 1975.
6. R. Pindyck and D.L. Rubinfeld, Microeconomics, Macmillan Publishing Company, New York, 1989.

Reference:

1. R.J. Gordon, Macroeconomics 4th Edition, Little Brown & Co., Boston, 1987.
2. William F. Shughart II, The Organization of Industry, Richard D. Irwin, Illinois, 1990. (Chapter 3).

Personnel Psychology (I)
T. Y. B. Tech
ILOE AS (17005)

Teaching Scheme- 2 Lectures per week

Examination Scheme-
3 Assignments for 60 marks
End semester of 40 marks

Objectives:

1. To enable to understand basic concepts in organizational set up.
2. To create awareness about corporate world and efficacy of employee.
3. To understand importance of motivation and how to motivate others.
4. To understand the importance of self management

Course Outcomes

a. Students will have understanding of organizational concepts and behavior.
b. Students will have understanding about their own personality for corporate world.
c. Students will understand importance of motivation
d. Students will understand the importance of self management and development.

Course Content-

Unit 1- Introduction- Basic concepts in Organizational set up and its importance 2hrs

Unit 2- Personality and corporate world- Know and accept you. Preparing for corporate world, approaches towards work 7 hrs

Unit 3 - Motivation- Self motivation and motivating others in their job 5hrs

Unit 4- Self management & development- Efficient working habits, self training and self development 5hrs

Text Books:

1. Khana S.S.- (2016) Organizational Behaviour(Text and Cases) Chand and company Pvt. Ltd. Delhi.
2. Rae Andr'e :- (2008) organizational behavior. Dorling Kindersley (India) Pvt. Ltd.
3. Wallace Hand Masters L.- (2008) Personality development..Cengage Learning India Pvt. Ltd.

Referece books:

1. Robbins S, JudgeA, Vohra N:- (2013)Organizational behavior.(15th ed) Pearson Education,Inc.
2. Singh Kavita:- (2010) Organizational behavior-Text and cases. Dorling Kindersley (India) pvt. Ltd.

GERMAN LANGUAGE –I
ILOE (T.Y.B.Tech.)

Teaching Scheme: 2 Hours/ week

Evaluation Scheme: Total Marks
Oral Exam: 20 Marks
Written Exam: 80 Marks

Course Education Objectives (CEO)

1. Introduction of Germany
2. Greetings, phrases, vocabulary
3. Understanding of numbers till 100
4. Grammar- Introductory Sentence Formation, Articles, Pronouns, Tense, Prepositions
5. Question Formation

Course Outcomes (CO)

a) Students would know the basic information of Germany
b) Students would be familiar with the pronunciation of German letters and greetings
c) Students would be able to count till 100
d) Students would be able to introduce themselves
e) Students would be able to form basic questions
f) Students would be able to read the city map

Unit I **[08 hrs]**

Start auf Deutsch: (Begin in German)

Deutschland, Deutsch sehen und hören, erste Kontakte, Texte: Lied, Postkarte, Wortfelder: internationale Wörter, deutsche Namen

Unit II **[06 hrs]**

Café: (Café)

Gespräche im Café, Texte: Getränkekarte, Telefonbuch, Rechnungen, Wortfelder: Gespräche im Café, Zahlen bis 100, Strukturwörter

Unit III **[05 hrs]**

Städte, Länder, Sprachen: (Cities, Countries, Languages)

Sehenswürdigkeiten in Europa, Sprachen in Europa, Nachbarsprachen, Texte: Landkarten, ein Statistik, Wortfelder: Himmelsrichtungen, Sprachen

Unit IV **[05 hrs]**

Menschen und Haüser: (People and Houses)

Wohnwelten, Texte: Möbelkatalog, E-Mail, Wohnungsgrundriss, Wortfelder: Räume und Möbel, Wohnformen

Text Book:

1. Funk, Kuhn, & Demme. Studio d A1. Deutsch als Fremdsprache. 2011. Goyal Publishers & Distributors Pvt. Ltd. Delhi, India

Japanese Language –I
ILOE (T.Y.B.Tech.)

Teaching Scheme: 2 Hours/ week

Evaluation Scheme: Total Marks
Oral Exam: 20 Marks
Written Exam: 80 Marks

Course Education Objectives (CEO)

1. Introduction to Japan & Japanese language.
2. Greetings, Set phrases, Vocabulary
3. Understanding of numerals, counting
4. Introduction to Japanese Grammar - Sentence Formation, Particles, Pronouns, Tense, Adjectives, Basic verbs
5. Question Formation

Course Outcomes (CO)

a) Students would know the basic information of Japan
b) Students would be familiar with the pronunciation, Accent, Intonation and Japanese writing System Hiragana, Katakana and Kanji
c) Students would be able to speak daily greetings
d) Students would be able to count the numerals
e) Students would be able to introduce themselves, Family members
f) Students would be able to form basic questions
g) Students would be able to understand Colors, Years ,Months and Days, Time expressions, Directions to read the city map

Unit I **[06 hrs]**

Introduction to Japanese Syllables (phonetic alphabet), greetings & Self introduction, Identifying things, point objects and listen to their names, Listen to things and places etc. Creating shopping lists.

Unit II **[06 hrs]**

Introduction to Time, day of the week, simple inquiries on telephone, Means of transport, Basic conversations of everyday life.

Unit III **[06 hrs]**

Frame questions in Japanese. Vocabulary of giving and receiving objects, Stating impressions/things surrounding us, Expressing likes and dislikes, good/bad, possessions,

Talking about the country, town and the environment.

Unit IV **[06 hrs]**

Quantity, number of people, time, period etc., Stating thoughts and impressions, Conveying movement (e.g. go / come).

Text book:

1. Minnano no Nihongo 1-1.Goyal Publishers& Distributors Pvt. Ltd. Delhi, India

Semester - V

(HSMS) English Language Proficiency I

Course Code: AS (ILE) 17001

Teaching Scheme: **Evaluation Scheme:**

Lectures: 2Hr/week **T1 & T2: 25 Marks each**

End-Sem. Exam: 50 Marks

Course Objectives:

a. To help students boost their confidence, communicate effectively and to present their ideas in a rational and logical manner

b. To apply effective writing skills widely practised across the globe

c. To enhance their linguistic competence and grasp intricacies involved in the development of their communicative ability to be employable

d. To help students understand the basic concept of employability and its importance in their career path

e. To make them industry ready and enhance employability

Course Outcomes:

1. Students will be able to communicate well using meaningful sentences for conversation or speech.
2. They will be able to reproduce their understanding of concepts of communicating using English language
3. Students will be able to read and comprehend communication well and write an effectively and enhance formal communication
4. Students will be able to better Presentation skills and participate in healthy discussions both formal and informal among peers
5. They will be more confident facing interviews, acquiring professional skills and will be industry ready

Unit 1: Communication as a skill

Basic understanding of Communication as a Skill and its need for effective business communication for Engineers

Unit 2: **Conversational Skill Development**

Formal and informal expressions, group discussions, Vocabulary Building

Unit 3: **Business Writing:**

Letter Writing, CV, Resume, Statement of Purpose

Unit 4: Job Readiness, Interview Skills and Mock Interviews

Reference books:

- Business Communication by Shalini Verma (2nd Edition) (Vikas Publishing House)
- Communication for Business: A Practical Approach by Shirley Tailor (Longman)
- Communication Skills for Engineers by S. Mishra & C. Muralikrishna (Pearson)
- Communication Skills for Technical Students by T.M. Farhathullah (Orient Longman)
- Enhancing Employability at Soft Skills by Shalini Varma (Pearson)
- Essential English Grammar (Elementary & Intermediate) Raymond Murphy (CUP)
- Written Communication in English by Saran Freeman (Orient Longman)

College of Engineering, Pune

ILE18016

B.Tech. ILOE

Syllabus of 'Polymer Technology'

(ILOE offered by Applied Science dept)

Test 1: 20 marks, 1 hr duration
Test 2: 20 marks, (presentation)
ESE: 60 Marks, (3 hrs duration)

Course Outcomes

a. Able to classify between various polymer mechanisms , polymerization techniques
b. Identify relation between structure property and application of polymers in different fields of Engineering.
c. Students will be familiar with composites, specialty polymers, photo luminescent polymers, high strength high thermal stability polymers
d. Appreciating impact of development in polymers in different engineering applications.

Unit – I: Introduction (3Hrs)

Polymer & macro molecule, monomer, functionality, copolymer, polymer blend, plastic and resin, natural polymers. Classification of polymers: based on source, structure, applications, thermal behavior, mode of polymerization..

Unit-II: Properties of polymers (6 Hrs)

Crystalline and amorphous status, melting and glass transition temperatures and their determination, effect of polymer structure on mechanical, physical, chemical, and thermal properties. Thermodynamics of polymer dissolution.

Unit –III: : Commercially important polymersrs (7 Hrs)

Synthesis, properties and application of some important polymers; i) Polyethylene (HDPE&LDPE), ii) Teflon iii) Photo luminescent polymers viii) Silicones ix) conducting x)Kevlar (aramid) x) thermocole xi) Inorganic polymers xii) polymer composites

Unit-IV: Mechanisms of Polymerization and polymerisation techniques (9 Hrs)

Condensation, and Addition polymerization; a) free radical addition polymerization,
Mass or Bulk polymerization process, solution, suspension polymerization process and emulsion polymerization method comparison of merits and demerits of these methods. brief description of: i) Compression and transfer moulding ii) Injection moulding iii) Extrusion iv) Blow moulding v) Calendaring vi) Laminating and pultrusion

Unit-V: Polymer additives (7 Hrs)

Role of the following additives in the polymers: i) Fillers and reinforcing fillers ii) Plasticizers iii) Lubricants iv) Antioxidants and UV stabilizers v) Blowing agents vi)Coupling agents vii)Flame retardents viii) Inhibitors Compounding of polymer resins,

Unit VI :
Polymer Degradation techniques, Bio compatibility, Polymer Waste Management (4 Hrs)

Textbook & Reference:

Text book of polymer science by Billmeyer, F.W. Jr., Wiely&sons
Polymer Science by Gowarikar

(ML-18001) INTELLECTUAL PROPERTY RIGHTS

Teaching Scheme

Lectures : 1 hr/week

Examination Scheme

Internal Evaluation 50 marks
End-Sem Exam- 50 marks

Unit 1 **(02)**

Introduction: Nature of Intellectual Property: Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development.

Unit 2 **(02)**

International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 3 **(03)**

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit 4 **(03)**

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Unit 5 **(03)**

Registered and unregistered trademarks, design, concept, idea patenting.

Reference Books

- Resisting Intellectual Property by Halbert ,Taylor & Francis Ltd ,2007
- Industrial Design by Mayall, Mc Graw Hill
- Product Design by Niebel, Mc Graw Hill
- Introduction to Design by Asimov, Prentice Hall
- Intellectual Property in New Technological Age by Robert P. Merges, Peter S. Menell, Mark A. Lemley
- Intellectual Property Rights Under WTO by T. Ramappa, S. Chand.

College of Engineering, Pune
Nanobiotechnology and Bioengineering
Final Year B. Tech. Program

Teaching Scheme
Lectures : 3 lectures/week

Examination Scheme
T1-**20** (Project/Assignment/s)
T2-3**0** (Project)
Semester End Examination-**50**

Objective: Nanotechnology and bioengineering transform basic science into novel materials, devices and processes for improved sustainability and health. They play a vital role in current and emerging technologies, and contribute to all areas of engineering through materials expertise including developing new materials and improving existing ones. Nano-biotechnology and Bioengineering applications are as diverse as sustainable energy, regenerative medicine, biomedical imaging, drug and vaccine delivery, and personalized medicine. The impact of these new technologies will be felt across a wide range of endeavors, from therapeutic and tissue regeneration products, to bioderived consumer products and environmental applications.

The core aim of this course will be to find out practical solutions in medical and biomedical sciences using engineering approaches and analyses. This course will be useful for engineering students to evolve better and create research and job opportunities in Life sciences, biomedical sciences and healthcare sector.

Syllabus for Nanobiotechnology and Bioengineering

A. UNIT-I: Introduction to Nanobiotechnology for Engineers		**(05)**
a) Introduction to Nanobiotechnology and nanomaterials; Integration of engineering applications to biology and health. b) Types of nanomaterials and their Properties, Applications in life science and biomedical science; Biological relevance of self-assembly of colloidal nanostructures; c) The concept of biocompatibility of nanomaterials; Bioactive nanoparticles, carbon nanotubes, polymeric nanomaterials, Implications in life science research, medicine, and tissue engineering; Techniques for nanomaterial characterization.		
B. UNIT-II: Nanobiotechnology for Engineers		**(09)**
a) Biosensors: The concept of biosensors and diagnostics; Components and design of Biosensors, Different types of Biosensors; Biophotonics & bioimaging; Lab-on-chip; Point-of-Care Diagnosis. b) Nano-engineered biosensors in biomedical care and diagnosis; Nanomaterials-Biomolecules interactions; Nanomaterials in biosensors and bio-imaging; Fiber Optic biosensors in biomedical applications. c) Nanotechnology in vaccines and drug delivery; Engineering and Biological aspects of targeted drug delivery; Drug delivery using nanomaterials; Nanomedicine; Risks and Regulatory Aspects.		

C. **UNIT-III: Fundamentals of Biomaterials for Engineers**		**(06)**

a) Fundamentals of biomaterials science: The concept of functional biomaterials. Classes of biomaterials used in medicine and their basic properties; Understanding medical requirements and clinical significance.

b) Engineering Biomaterials, functional biomaterials development and characterization; Biomaterials development and processing as implants and medical devices.

c) Biomaterials and bio-interfaces, biocompatibility at different levels of organization; Understanding cell function in response to environmental cues; FDA regulations.

D. **UNIT-IV: Engineered Materials and Tissue Engineering**		**(08)**

a) Engineered materials in Nature; Bio-inspired materials; technological aspects of biomaterials; Development of novel functional proteins and peptide motifs and characterization of their physical and biological properties and applications.

b) Stem cells and Tissue engineering: Embryonic stem cells (ESC) and induced pluripotent stem cells, early embryonic development, ESC laboratory methods, biomaterials for directed differentiation and other stem cell manipulations, and clinical uses of stem cells.

c) Three-dimensional culture and tissue engineering; Design and engineering of biological substitutes; Engineering and 3D bioprinting of tissues and organs.

E. **UNIT-V: Bio-MEMS, Bioengineering and Experimental design**		**(08)**

a) Fundamentals of biomedical microelectromechanical systems (BioMEMS); Basics of nano- and microfabrication, soft-lithography, DNA arrays, protein arrays, electrokinetics, electrochemical, transducers, microfluidic devices.

b) BioMEMS and biosensors, microfluidic and nanofluidic systems for bioengineering, drug delivery microsystems, bioanalytical applications, advanced biomolecular probes.

c) Experimental biochemical and molecular techniques from a quantitative engineering perspective. Experimental design, data analysis, and scientific communication in Bioengineering.

d) Path breaking discoveries and innovations in the field of Nanobiotechnology and Bioengineering.

MLC-1503 INTELLECTUAL PROPERTY RIGHTS

Teaching Scheme

Lectures : 1 hr/week

Examination Scheme

Internal Evaluation 50 marks
End-Sem Exam- 50 marks

Unit 1 **(02)**

Introduction: Nature of Intellectual Property: Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development.

Unit 2 **(02)**

International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit 3 **(03)**

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

Unit 4 **(03)**

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

Unit 5 **(03)**

Registered and unregistered trademarks, design, concept, idea patenting.

Reference Books

- Resisting Intellectual Property by Halbert ,Taylor & Francis Ltd ,2007
- Industrial Design by Mayall, Mc Graw Hill
- Product Design by Niebel, Mc Graw Hill
- Introduction to Design by Asimov, Prentice Hall
- Intellectual Property in New Technological Age by Robert P. Merges, Peter S. Menell, Mark A. Lemley
- Intellectual Property Rights Under WTO by T. Ramappa, S. Chand.

(ML-16005)CONSTITUTION OF INDIA

Teaching Scheme
Lectures: 1 hr/week

Examination Scheme
Internal Evaluation 50 marks
End-Sem Exam- 50 marks

Unit 1 **(02)**
Meaning and history of Constitution.
Understanding the concept of Human Rights and Fundamental Rights.

Unit 2 **(03)**
Introduction to The Constitution of India, understanding its objects. Preamble to the constitution of India. Fundamental rights under Part – III, details of Exercise of rights, prerogative writs, Limitations & Important cases.

Unit 3 **(02)**
Relevance of Directive principles of State Policy under Part – IV, Fundamental duties & their significance. Relationship between the Fundamental Rights, Directive Principles and Fundamental Duties

Unit 4 **(03)**
Union Executive – President, Prime Minister, Parliament & the Supreme Court of India.

Unit 5 **(02)**
State executive – Governors, Chief Minister, State Legislator and High Courts

Unit 6 **(02)**
Constitutional Provisions for Scheduled Castes & Tribes, Women & Children & Backward classes. Emergency Provisions.

Unit 7 **(02)**
Electoral process, Amendment procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments.

Text Books

 Introduction to the Constitution of India by Durga Das Basu (Students Edn.) Prentice – Hall EEE, 19th/20th Edn., 2001.

 Engineering Ethics by Charles E.Haries, Michael. S.Pritchard and Michael J.Robins Thompson Asia, 2003-08-05.

Reference Books

 An Introduction to Constitution of India by M.V. Pylee, Vikas Publishing, 2002.