SEM VII

Generic Elective: (GE)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Environment Management (GE)	4	2	0	2	Class XII pass.	Nil

Learning Objectives

Course Objective: Provides an understanding of how to identify and evaluate the environmental impacts of developmental projects or product/service. Understanding the nature of environmental impact and minimizing the impact within the context of Environmental management. It demonstrates the types of information required for assessing the impacts of a proposal on specific environmental parameters. To impart knowledge of geospatial modelling in evaluating and mitigating the environmental impacts.

Learning outcomes

After completing this course, student should be able to;

- to evaluate the Environmental Impact Assessment (EIA) &
- to understand the legal frameworks associated with Environment in India.
- to use Geospatial and environmental information through opensource.
- to prepare basic maps e.g., elevation, vegetation etc.
- to classify Land use and Land cover information and maps.
- to assess urbanization through spectral band index.
- to quantify the complex environmental impacts through GIS.

SYLLABUS

Unit I: Introduction to Environmental Impact Assessment (EIA) and Environmental Management (EM). EIA: Scoping, Public consultation, Expert appraisal committee and Environmental clearance of various projects; Introduction to Satellite remote sensing and Geographical information system (8 hours)

Unit II: Satellite image processing: Land use Land cover, Spectral bands of vegetation through Normalized difference vegetation index (NDVI), Ecosystem modelling: Satellite topographical data) and NDVI, Urbanization, Urban Planning and Growth - Central Place Theory (8 hours)

Unit III: Geometry and Ordering, Burgess Model for City Planning, Growth Pole and Growth Centre Theory and Demographic Transition Mode, Waste Management; Municipal Solid Waste Management, Hazardous Waste Management & Radioactive Waste Management, Waste Management: Physicochemical Treatment of Solid and Hazardous Waste, Biological Treatment of Solid and Hazardous Waste & landfill design
(8 hours)

Unit IV: Environmental management tools and techniques of sustainable development. Environmental Law (6 hours)

Practical component – (30 hours)

- Environmental Impact modelling
- Environmental Index modelling
- Environmental Impact assessment using spatial database.
- Urbanization and urban sprawl assessment using satellite data.

Essential/recommended readings

1. Environmental Management: Principles and Practice (Routledge Environmental Management Series), Chris Barrow, Routledge, 2003.
2. Environmental Management in Organizations: The IEMA Handbook, John Brady, Alison Ebbage and Ruth Lunn, Earthscan, Washington, DC., 2011.
3. Essentials of Environmental Management, Paul Hyde and Paul Reeve, IOSH Services Ltd. (U. K.), 2004.
4. Textbook of Environmental Studies, Erach Bharucha, UGC 5. Fundamental Concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

Generic Elective: (GE)

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course	Department offering the course
		Lecture	Tutorial	Practical/ Practice			
Principles of Financial Decision Making	**4**	**3**	**1**	**0**	**Class XII pass**	**Basic knowledge of business and management concepts**	**Management Faculty of CIC**

Learning Objectives

1. To provide students with foundational knowledge of financial principles.
2. To enable students to understand the role of finance in technology-driven businesses.
3. To develop analytical skills for financial decision-making in IT projects.
4. To bridge the gap between technical expertise and business acumen.

Learning outcomes

By the end of the course, students will:

1. Understand the fundamental principles of financial management.
2. Evaluate investment opportunities and assess project feasibility.
3. Manage the financial aspects of IT operations and projects effectively.
4. Apply financial tools and techniques to optimize decision-making in technology-based enterprises.

SYLLABUS OF GE-7

Unit I- Introduction to Financial Management: Definition, Scope, and Objectives of Financial Management, Financial Management in Technology-Oriented Businesses, Role of IT in Modern Financial systems. Financial Statements and Analysis: Understanding Financial Statements: Balance Sheet, Profit & Loss Statement, and Cash Flow Statement, Ratio Analysis and Its Application in IT Projects, Importance of Financial Metrics for IT Firms (e.g., Return on Investment (ROI), Payback Period, Net Present Value (NPV). **(13 hours)**

Unit II- Time Value of Money and Investment Decisions: Concept of Time Value of Money: Present and Future Value, Evaluation of Investment Decisions: Payback Method, NPV, Internal Rate of Return (IRR), Risk Analysis in IT Investments.
(10 hours)

Unit III- Financing and Capital Structure: Sources of Finance for IT Companies (Venture Capital, Private Equity, Debt). Optimal Capital Structure and Cost of Capital. Impact of Technology Trends on Financing. Budgeting and Cost Control: Principles of Budgeting in IT Projects, Types of Budgets: Operating, Capital, and Cash Budgets, Techniques for Cost Control in IT Systems and Infrastructure. **(9 hours)**

Unit IV- Working Capital Management: Definition and Components of Working Capital, Managing Receivables, Inventory, and Payables, Working Capital Challenges in IT

Companies. Emerging Trends in Financial Management: FinTech and Its Applications in Financial Management, Financial Impact of AI, Big Data, and Cloud Computing, ESG (Environmental, Social, and Governance) Factors in Financial Decision-Making.

(10 hours)

Essential/recommended readings

Pandey, I. M. (2021). *Financial management* (12th ed.). McGraw-Hill Education.
Chandra, P. (2022). *Financial management: Theory & practice* (11th ed.). McGraw Hill.

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CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

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		Lecture	Tutorial	Practical/ Practice			
Biodefense and Bioengineering	**4**	**2**	**0**	**2**	**12th Pass**	**Nil**	**Biology faculty of CIC**

Learning Objectives

This module is designed to:

- Introduce students to the complexity of the immune system, infections
- Introduce students to tools and techniques related to immunity including the development of vaccines and immunological tests.

Learning outcomes

After studying this course, the students will be able to:

- Comprehend the complexity of the immune system
- Develop an understanding of the basis of functioning the immune system against infections and cancer
- Develop skills in immunological techniques such as ELISA, DOPE test, simulated pregnancy test etc.

SYLLABUS

Unit I: Overview of Immune system (6 hours)

Immune system and its classifications, types of immunity, cells and organ of the immune system

Unit II: Mechanisms of immunity (8 hours)

Humoral and cell-mediated immunity, antigen and antibody interaction, antibody structure and classification, Ag-Ab complex and clearing

Unit III: Tools and Techniques related to Immunology (8 hours)

Western blotting, Immunoprecipitation, Immunolocalization, ELISA, Immunodiffusion, Rocket Electrophoresis, DOPE test, production and purification of monoclonal and polyclonal antibodies, applications.

Unit IV: Emerging pathogens and host-pathogen interactions (8 hours)

New pathogens and diseases, single chain antibody engineering, AIDS, cancer and other disease immunity

Practical components **(30 hours)**

1. Blood smear preparation and staining
2. Immunodiffusion demonstration
3. ELISA test
4. Western blotting
5. Immunoprecipitation
6. Pregnancy test (Simulation experiment)

Essential/recommended readings

1. *Kuby Immunology*, Owen and Punt, W. H. Freeman & Company, 7 edition, 2013.
2. *Microbiology: an introduction*, Tortora et al., Benjamin Cummings, 11 edition 2012.
3. *Immunology and Immunotechnology*, Ashim K Chakravarty, , O.U. P, 1 edition, 2006.
4. *The Biology of Cancer*, Robert Weinberg, Garland Science

Generic Elective: (GE)

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)	Department offering the course
		Lecture	Tutorial	Practical/ Practice			
Devices and Nanotechnology (GE)	**4**	**3**	**1**	**0**	**Class XII pass**	**Functional knowledge on electronics and**	**Physics/Electronics faculty of CIC**

						circuit analysis	

Course Objective

This module provides interactive learning of nano-science and its applications. It emphasizes learning in material science, medical, photonics, optical, electronic and magnetic devices at nanoscale. It intends to enlighten about identification, fabrication and characterization of nano based devices.

Course Learning Outcomes:

• For students, this course on devices and nanotechnology becomes very important, as this exposes them to the most versatile and interdisciplinary world of nanotechnology, which is emerging as a branch having its relevance in various fields like medical, biotechnological, industrial, forensic science, material science etc.

• Students would be exposed to the relevant concepts of nanomaterials, their identification and characterization along with studying their applications in optical, electronic and magnetic devices.

• Nano based devices and sensors are a major attraction for students, because this not only makes them understand about the basic principles related to them, but it also inculcates the skills among students, which are required to develop nano-based formulations or devices as a whole.

Keywords: Optical devices; Nanoscale photonic devices; Sensor Technology; Nanoscale CMOS design

Unit I: Optical devices, electronic devices, liquid crystal and magnetic devices and their functionalitySpintronic devices (including spin valves and MRAM devices) - Nanoscale semiconductor electronic devices - CMOS at sub-15nm gate length, Carbon nanotubes, III-V and wide-bandgap devices - Devices for quantum computing **(12 hours)**

Unit II: Nanoscale photonic devices - Basic properties of liquid crystals - Molecular properties of the organic materials and their use in current production and research level electronic devices - Thin Films Growth and Epitaxy, Characterization of Nanomaterials **(9 hours)**

Unit III: Introduction to Sensor Technology - CMOS scaling challenges at nanoscale regimes - Device technologies for sub 100nm CMOS - Device scaling and ballistic MOSFET **(12 hours)**

Unit IV: Nanoscale CMOS design, Nanoscale circuits - Non classical CMOS **(9 hours)**

References

1. Nanotechnology for Electronic Materials and Devices, Korkin, A.; Gusev, E.; Labanowski, J.K.; Luryi, S. Springer, 2007

2. Electronics Composite -Modeling, Characterization, Processing, and MEMS Applications-Minoru Taya, Cambridge University Press, 2008

3. Nanotechnologies for Future Mobile Devices - Tapani Ryhänen, Mikko A. Uusitalo, Olli Ikkala, Asta Kärkkäinen, Cambridge University press, 2010

4. High-Speed Heterostructure Devices From Device Concepts to Circuit Modeling - Patrick Roblin, Hans Rohdin, Cambridge University press, 2006