SEMESTER-VII, COMPUTER SC & ENGG

100708	Biology for Engineers	2L:1T:0P	3 Credits

Module 1: Introduction **Lecture: 2 hrs.**

Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18^{th} Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Module 2: Classification **Lecture: 3 hrs.**

Purpose: To convey that classification *per se* is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted.

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation - Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (f) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus.

Module 3: Genetics **Lecture: 4 hrs.**

Purpose: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences"

Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Module 4: Biomolecules **Lecture: 4 hrs.**

Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine.

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Module 5: Enzymes **Lecture: 4 hrs.**

Purpose: To convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

Module 6: Information Transfer **Lecture: 4 hrs.**

Purpose: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Module 7: Macromolecular analysis **Lecture: 5 hrs.**

Purpose: How to analyse biological processes at the reductionist level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Module 8: Metabolism **Lecture: 4 hrs.**

Purpose: The fundamental principles of energy transactions are the same in physical and biological world.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keqand its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge.

Module 9: Microbiology **Lecture: 3 hrs.**

Purpose: Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Suggested Reference Books:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

Course Outcomes

After studying the course, the student will be able to:

1. Describe how biological observations of 18th Century that lead to major discoveries.
2. Convey that classification per seis not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological
3. Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
4. Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
5. Classify enzymes and distinguish between different mechanisms of enzyme action.
6. Identify DNA as a genetic material in the molecular basis of information transfer.
7. Analyse biological processes at the reductionistic level
8. Apply thermodynamic principles to biological systems.
9. Identify and classify microorganisms.

100701 Induction Program

Induction program (mandatory)	3 weeks duration
Induction program for students to be offered right at the start of the first year.	• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch &Innovations

100713 (Common Paper)(CE,CS,IT)	**Soft Skills and Interpersonal Communication**	**3L:0T:0P**	**3 Credits**

Detailed contents:

Module 1 **Lecture 8 hrs.**

Self-Analysis: Swot Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem.

Module 2 **Lecture 8 hrs.**

Creativity: Out of Box Thinking, Lateral Thinking.

Module 3 **Lecture 8 hrs.**

Attitude: Factors Influencing Attitude, Challenges and Lessons from Attitude, Etiquette; Motivation: Factors of Motivation, Self-Talk, Intrinsic & Extrinsic Motivators.

Module 4 **Lecture 8 hrs.**

Goal Setting: Wish List, Smart Goals, Blue Print for Success, Short Term, Long Term, Life Time Goals; Time Management: Value of Time, Diagnosing Time Management, Weekly Planner, To Do List, Prioritizing Work.

Module 5 **Lecture 8 hrs.**

Interpersonal Skills: Gratitude - Understanding the relationship between Leadership Networking & Team work. Assessing Interpersonal Skills Situation description of Interpersonal Skill. Team Work - Necessity of Team Work Personally, Socially and Educationally.

Text Book:

2. Soft Skills, 2015, Career Development Centre, Green Pearl Publications.

Reference

3. Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.
4. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.

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105713	Cyber Security	3L:0T:0P	3 Credits

Objective of the Course:

The course has been designed to give students an extensive overview of cyber security issues, tools and techniques that are critical in solving problems in cyber security domains.The course aims atproviding students with concepts of computer security, cryptography, digital money, secureprotocols, detection and other security techniques. The course will help students to gaugeunderstanding in essential techniques in protecting Information Systems, IT infrastructure,analysing and monitoring potential threats and attacks, devising security architecture andimplementing security solutions. The students will also have a wider perspective to informationsecurity from national security perspective from both technology and legal perspective.

Detailed contents

Module 1 **Lectures 2 hrs.**

Cyber Security Concepts: Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering(Social Engineering, Foot Printing & Scanning).Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners.

Module 2 **Lectures 4 hrs.**

Cryptography and Cryptanalysis: IntroductiontoCryptography,SymmetrickeyCryptography,AsymmetrickeyCryptography,MessageAuthentication,Digital Signatures, Applications of Cryptography. Overview of Firewalls-Types of Firewalls, User Management, VPN Security, Security Protocols: - security atthe Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security atNetwork Layer-IPSec.

Open Source/ Free/ Trial Tools: Implementation of Cryptographic techniques, OpenSSL, Hash Values Calculations MD5, SHA1, SHA256, SHA 512, Steganography (Stools)

Module 3 **Lectures 6 hrs.**

Infrastructure and Network Security: Introduction to System Security, Server Security, OS Security, Physical Security, Introduction toNetworks, Network packet Sniffing, Network Design Simulation. DOS/DDOS attacks. AssetManagement and Audits, Vulnerabilities and Attacks. Intrusion detection and PreventionTechniques,Hostbased Intrusion prevention Systems, Security Information Management,Network Session Analysis, System Integrity Validation.

Open Source/ Free/ Trial Tools: DOS Attacks, DDOS attacks, Wireshark, Cain &abel, iptables/ Windows Firewall, snort, suricata, fail2ban.

Module 4 **Lectures 8 hrs.**

Cyber Security Vulnerabilities& Safe Guards: Internet Security, Cloud Computing &Security, Social Network sites security, Cyber SecurityVulnerabilities-Overview, vulnerabilities in software, System administration, Complex NetworkArchitectures, Open Access to Organizational Data, Weak Authentication, Authorization,Unprotected Broadband communications, Poor Cyber Security Awareness. CyberSecuritySafeguards- Overview, Access control, IT Audit, Authentication. Open Web Application SecurityProject (OWASP), Web Site Audit and Vulnerabilities assessment.Open Source/ Free/ Trial Tools: WinAudit, Zap proxy (OWASP), burp suite, DVWA kit.

Module 5 **Lectures 8 hrs.**

Malware: Explanation of Malware, Types of Malware: Virus, Worms, Trojans, Rootkits, Robots, Adware's,Spywares, Ransom wares, Zombies etc., OS Hardening (Process Management, Memory Management, Task Management, Windows Registry/ services another configuration), MalwareAnalysis.

Open Source/ Free/ Trial Tools: Antivirus Protection, Anti Spywares, System tuning tools, Anti Phishing.

Module 6 **Lectures 8 hrs.**

Security in Evolving Technology: Biometrics, Mobile Computing and Hardening on android and ios, IOT Security, Web server configuration and Security. Introduction,Basic security for HTTP Applications and Services,Basic Security for Web Services like SOAP, REST etc., Identity Management and Web Services,Authorization Patterns, Security Considerations, Challenges.

Open Source/ Free/ Trial Tools: adb for android, xcode for ios, Implementation of REST/ SOAP web services and Security implementations.

Module 7 **Lectures 9 hrs.**

Cyber Laws and Forensics: Introduction, Cyber Security Regulations, Roles of International Law, the state and Private SectorinCyberspace, Cyber Security Standards. TheINDIAN Cyberspace, National Cyber SecurityPolicy 2013. Introductionto Cyber Forensics, Need of Cyber Forensics, Cyber Evidence,Documentation and Management of Crime Sense, Image Capturing and its importance, PartialVolume Image, Web Attack Investigations, Denial of Service Investigations, Internet CrimeInvestigations, Internet Forensics, Steps for Investigating Internet Crime, Email CrimeInvestigations.

Open Source/ Free/ Trial Tools: Case Studies related to Cyber Law, Common Forensic Tools like dd, md5sum, sha1sum, Ram dump analysis, USB device.

List of Suggested Books:

1. William Stallings, "Cryptography and Network Security", Pearson Education/PHI, 2006.
2. V.K. Jain, "Cryptography and Network Security", Khanna Publishing House.
3. Gupta Sarika, "Information and Cyber Security", Khanna Publishing House, Delhi.
4. AtulKahate, "Cryptography and Network Security", McGraw Hill.
5. V.K. Pachghare, "Cryptography and Information Security", PHI Learning
6. Nina Godbole, "Information System Security", Wiley
7. Bothra Harsh, "Hacking", Khanna Publishing House, Delhi.

Learning Outcomes:

After completion of this course, the students should be able to:

1. Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information.
2. Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios
3. Identify common trade-offs and compromises that are made in the design and development process of Information Systems
4. Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection.

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105707	E-Commerce and ERP	3L:0T:0P	3 Credits

Module 1 **Lecture: 10 hrs.**

Introduction to E- Commerce: Evolution of E-commerce, Advantage and Disadvantage of E Commerce, Roadmap of E-Commerce in India. Business Models of E–Commerce: Model Based On Transaction Party: B2B, B2C, C2B, C2C.

Module 2 **Lecture: 10 hrs.**

E marketing: The scope of E-Marketing, Identifying Web Presence goals, Uniqueness of the web, Meeting the need of website visitors, Website Design Issues: Factors that make People Return to Your Site, Strategies for Website Development. Site Adhesion: Content, format and access: maintaining a Website, E- Advertising, E-Branding,

Module 3 **Lecture: 10 hrs.**

E–Payment System: Digital Payment Requirement, Digital Token based E-Payment System, Electronic Cash, Smart card and Electronics payment system: Credit and Debit Card, Virtual Currency, Digital wallet, Risk of Electronics payment system, Digital Signature.

E Security: Security On the Internet: Network and Website Security Risk: Denial-of-Service attack, Viruses, Unauthorized access to computer Network. Security Standards: Firewall, Cryptography, Key Management, Password Systems, Digital certificates, Digital signatures.

Module 4 **Lecture: 10 hrs.**

Enterprise Resource Planning (ERP): Introductory Concepts, Advantages & disadvantages of ERP, ERP and Related Technologies: - Business Process Reengineering, Data Warehousing, Data Mining, Supply Chain Management. **ERP Implementation:** ERP Implementation Life Cycle –Implementation Methodology, Hidden Costs , Organizing Implementation – Contracts with Vendors, Consultants and Users , Project Management and Monitoring.

Module 5 **Lecture: 7 hrs.**

ERP Business Modules: Introduction to basic Modules of ERP System, Business Modules in an ERP Package- Finance – Manufacturing – Human Resource – Plant Maintenance – Materials Management – Quality Management – Sales and Distribution.

Case Study: Recent business issues on E-Commerce Perspective**.**

Text Books:

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill.
2. E-Commerce An Indian Perspective by P.T.Joseph, PHI

Reference Books

1. K.K. Bajaj, D. Nag “E-Commerce”, 2nd Edition, McGraw-Hill Education, New Delhi.
2. Bhaskar Bharat, “Electronic Commerce-Technology and Application”, McGraw-Hill Education, New Delhi.
3. Mary Sumner, “Enterprise Resource Planning”, 2005, PHI Learning India Pvt. Ltd. /Pearson Education, New Delhi.
4. Chan, “E-Commerce fundamentals and Applications”, Wiley India, New Delhi.
5. Vinod Kumar Garg and N.K .Venkata Krishnan, “Enterprise Resource Planning – concepts and Planning”, Prentice Hall, 1998.