

VUCS15003 : QUANTITATIVE APTITUDE

Hours: 30

Course Objective:

- To develop and strengthen the foundation of basic mathematics.

Course Outcomes:

On successful completion of the course, the students should be able to

- solve problems in mathematics by using Number series, divisibility test, HCF & LCM, problems on numbers, decimal fractions, simplifications, problems on ages, speed and distances
- formulate ratios and proportions, profit/loss, simple and compound interest

Unit 1: Number System I

Number series and divisibility test, HCF & LCM, problems on numbers.

6 hrs

Unit 2: Number System I

Simplifications, decimal fractions, problems on ages.

6 hrs

Unit 3: Speed and Distance

Speed, distance and time, problems on train, time and work.

6 hrs

Unit 4: Ratios and Proportions

Ratio, proportion, chain rule.

6 hrs

Unit 5: Interest


Profit and loss, simple Interest, compound Interest.

6 hrs

References:

- Praveen, R. V, (2013), *Quantitative Aptitude and Reasoning*, PHI Learning Pvt. Ltd.
Sharma, Arun, (2011), *Verbal Ability and Rc for Cat*, Tata McGraw-Hill Education.
Sinha, Nishit K, (2016), *Quantitative Aptitude for the CAT*, Pearson Education India.
Khatter, Dinesh, (2016), *The Pearson Guide to Quantitative Aptitude for Competitive Examinations*, (3e), Pearson Education India.


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VUCS15004 : INTRODUCTION TO XML

Hours: 30

Course Objective:

- To teach the basics involved in publishing content on the World Wide Web.

Course Outcomes:

After successful completion of the course, the student will be able to:

- analyze the elements and attributes of a web page
- develop web pages with HTML, XML and XML Object Model

Unit 1: Introduction to HTML

5 hrs

What is HTML - HTML Documents - Basic structure of an HTML document - Creating an HTML document - Mark up Tags - Heading-Paragraphs - Line Breaks - HTML Tags.

Unit 2: HTML Elements

6 hrs

Introduction to elements of HTML - Working with Text - Working with Lists, Tables and Frames - Working with Hyperlinks, Images and Multimedia - Working with Forms and controls.

Unit 3: Introduction to XML

7 hrs

The Need for XML - Structured Data and Formatting - Advantages of XML and HTML, XML Applications and Tools, Creating and Viewing XML Documents, XML Document Syntax, Validating XML Documents with DTDs

Unit 4: XML Entities and Attributes

7 hrs

XML essentials - Entities and attributes - Cascade Style Sheets - XML Scheme - Handling XML Documents and Data Binding - XML Namespaces.

Unit 5: XML Object Model

5 hrs

XML DOM - XSL Transformations - XSL Formatting Objects - XML and ASP- XML and Servlets - XML and Perl- WML

References:

- Thomas Powell, *HTML & CSS: The Complete Reference*, (5th Edition), McGraw Hill Education.
Williamson, (2001), *XML: The Complete Reference*, McGraw Hill Education.
Mike Mcgrath, *XML in easy steps*, McGraw Hill Education.

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Course Objective:

- To guide the beginning programmer in developing applications using visual programming.

Course Outcomes:

After successful completion of the course, the student will be able to:

- apply the programming controls in the constructing the flow of the program
- categorize the basic fundamental concepts of windows form controls and File handling
- design the graphical user interface using the controls
- integrate the connectivity between the user interface to the database

Unit 1: Getting started with Visual Basic

5 hrs

Arithmetic Operators, Data type, Statements, Control Statements, Loops, Arrays, Structures, Val and Structure functions, Creating Visual Studio Applications, Saving Visual Basic Application.

Unit 2: Windows Forms

6 hrs

Introduction to the windows forms, Setting the title Bar Text, Minimizing and Maximizing a form, Setting initial position of a form, Creating adding controls to a form, Setting controls Tab order, Naming Controls, Setting Properties at design time, Setting properties at run time, Creating a message box, Creating a Input box, Creating Dialog box, Commenting the code, Label, TextBox, Button, ComboBox and ListBox Controls: Label Control, Button Control, Combo Box Control, ListBox Control, Project Panel, PictureBox.

Unit 3: Progress Bar Controls

5 hrs

Panel Control, Picture box Control, Progress Bar Control, Checkbox, radio button, and group box controls: Checkbox control, Radio button control, Progress bar control, Menus, Font File Dialog Control, Color File Dialog Control

Unit 4: Accessing data using ADO.NET

8 hrs

What are Databases? Basic SQL statements, working with ADO.NET, Overview of ADO.NET objects, Data Grid View Control, accessing data using server explorer, creating a new data connection, accessing data using Data Adapters and Datasets, previewing data from Data Adapters, Connecting to an SQL server database.

Unit 5: File handling

6 hrs

File handling using FileStream, StreamWriter, StreamReader, BinaryReader, BinaryWriter classes, File and Directory Classes

References:

- Xue Bai, Michael Ekedah, (2006), *The Web Warrior Guide to Web Programming*, Thomson.
 Kogent Solutions Inc., (2008), *.Net Programming*, Black Book, Dream Tech.
 Joe Duffy, *Professional.Net Programming 2.0*, Wiley.
 Vikas Gupta, *.NET programming*.

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Course Objective:

- To inculcate knowledge in PL/SQL & Database Connectivity.

Course Outcomes:

On successful completion of the course, the students should be able to

- explain the concepts of SQL Environment and DDL Commands
- illustrate data retrieval with PL/SQL Commands
- develop PL/SQL triggers, cursors and functions

Unit 1: Introduction to SQL

5 hrs

SQL Environment – SQL – Logging into SQL - SQL Commands – Errors & Help – Oracle Tables: DDL: Naming Rules and conventions – Data Types – Constraints – Create, Display, Alter, Drop, Rename Tables.

Unit 2: Working with Table

6 hrs

DML – adding a new Row/Record – Customized Prompts – Updating and Deleting an Existing Rows/Records – retrieving Data from Table – Arithmetic Operations – restricting Data with WHERE clause – Sorting – DEFINE command – CASE structure. Built-in functions – Grouping Data - Join – Set operations.

Unit 3: PL/SQL - A Programming Language

7 hrs

History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Declaration – Assignment operation – Bind variables – Substitution Variables – Printing – Arithmetic Operators. Control Structures – Nested Blocks – SQL in PL/SQL

Unit 4: PL/SQL Cursors and Exceptions

7 hrs

Cursors – Implicit and Explicit Cursors and Attributes – Cursor FOR loops – SELECT...FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.

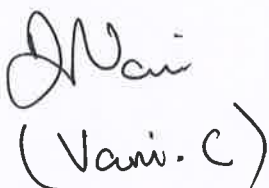
Unit 5: PL/SQL Composite Data Types

5 hrs

Records – Tables – Varrays. Named Blocks: Procedures – Functions – Packages – Triggers – Data Dictionary Views.

References:

- Dr.P.S.Deshpande, *SQL & PL/SQL for Oracle 11g Black Book*, dreamtech
Steven Feuerstein, Bill Pribyl, *Oracle PL/SQL Programming, (6th Edition)*
Steven Feuerstein, *Oracle PL/SQL Best Practices, (2nd Edition)*, O'Reilly


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VPCS13002: LIFE SKILLS FOR COMPUTER PROFESSIONALS

Hours: 30

Course Objectives:

- To explore the vital resources of life.
- To get focused with a definite purpose in life and create a compelling future with clearly defined goals.
- To break limiting patterns of thoughts, beliefs, behaviour and habits.
- To develop personal and interpersonal effectiveness.

Course Outcomes:

After successful completion of the course, the student will be able to:

- apply a techniques of problem solving to overcome life's challenges.
- recognise life values to integrate professional and personal life.
- create a compelling future with clarity defined goals .

Unit 1: Mastering Emotions:

6 hrs

Significance of mastering emotions, reactive and proactive people, ways to deal with emotions, avoiding inner conflicts, analysis of inner traits and negative traits, creating long- term changes.

Unit 2: Life Values

6 hrs

Types of life values- personal values, social values, professional values, spiritual values; Life Vision, beliefs and values, Life goals - personal development goals, family goals, educational goals, career goals, financial, material goals and social goals.

Unit 3: Effective Communication

6 hrs

Types of Communications - Verbal communication, Non- verbal communication, activities related to communications Presentation skills, listening skills. Activities based on Types of talk to get action, to inform, to convince

Unit 4: Problem solving

6 hrs

Defining problems, potential cause of problems, identification of possible solutions, finding the best solution and decision-making.

Unit 5: Successful Relationship

6 hrs

Principles of successful relationship: Ways to make impressive relationship, Methods to make people to like us, think in our way, bringing people to around you, ways to overcome worry and find peace and happiness.

References:

- Covey, S. R., & Covey, S. (2020). *The 7 habits of highly effective people*. Simon & Schuster.
Covey, S. R., Merrill, A. R., & Merrill, R. R. (1995). *First things first*. Simon and Schuster.

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VPCS15002 : ADVANCED PYTHON PROGRAMMING

Hours: 30

Course Objective:

- To understand the fundamental approach to solve the real world problems and to introduce the basic Python programming language and Python tools to work productively with data.

Course Outcomes:

After completing this course, the student will be able to:

- identify the right data analytics structure to solve a problem using Python.
- choose the right packages to suit the client/customer requirement and generate an effective solution.

Unit 1: Introduction to Python

5 hrs

Basics of Python – Introducing the python interpreter; Using the Interactive Prompt; Running Files with command lines; IDLE Basics; Using IDLE; Other IDEs.

Python's Core Data types; Numbers; Strings; Lists; Dictionaries; Tuples; Numeric type basics; Numeric literals; Built-in Numeric tools; Python Expression operators; Variables and Basic expressions; Taking input and displaying output; Adding comments.

Unit 2: Data structures in Python

5 hrs

Strings – Basic operations; Indexing and Slicing; String Methods; Lists in Action – Basic List operations; List Iteration and Comprehensions; Indexing, Slicing and Matrixes; Dictionaries – Basic Dictionary operations; Changing Dictionary in-place; More Dictionary methods; Tuples – Tuples in Action.

Unit 3: Decision making and Functions

5 hrs

Control flow statements; if statement; General format; Basic examples; if else statement; while loops; for loops; break, continue, pass and the Loop else; use of compound expression in conditional and looping construct. **Functions** – Grouping code under a name, Coding functions, def statements. Python Scope Basics-Scope rules; Name resolution: The LEGB rule; Scope example. Argument-passing basics-Arguments and Shared references.

Unit 4: Object Oriented Programming using Python

5 hrs

Creating a class, the class statement; General form, Example; Methods; Inheritance; Operator overloading; Static and Class Methods; Exception Handling: Errors in a python program, Default Exception Handler, Catching Exceptions; Raising Exceptions; User-Defined Exceptions. The try/except/else statement, the assert statement. Modules and packages: Creating modules and packages, Module Usage; The import statement; the from statement; the from * statement; Package import basics; Package import example.

Unit 5: Natural language processing

10 hrs

Overview of Text Mining; Need of Text Mining; working with text and databases; Tokenization: Regex, Word, Blank line, Sentence Tokenizers; Bigrams, Trigrams & Ngrams, Analyzing Sentence Structure, visualization, matplotlib libraries.

References:

- B. Muthukumaran (2010). *Information Technology for Management*, Oxford Higher Education.
Dr. Michael Arock, (2014). *Fundamentals of programming with C*. Yes Dee publishing. ITL
Balagurusamy. E, (2016). *Introduction to computing and problem solving using Python*. McGraw Hill Education Private Ltd.
Wes McKineey. (2013). *Python for Data Analysis*. (1st Edition). O'Reilly

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Course Objective:

- To introduce the basics of web designing and scripting.

Course Outcomes:

After completing this course, the student will be able to:

- write standards-compliant HTML code and CSS code to present HTML pages in different attractive ways.
- develop dynamic web pages by using JavaScript (Client side Programming) and write well-formed/valid XML documents.

Unit 1: Fundamentals of Internet

4 hrs

History; Internet addressing; Protocols: TCP/IP, HTTP; Domain name system; Intranet; URL; E-Mail; Directory services; News groups; Search engines.

Unit 2: HTML

4 hrs

Basics of Internet, Introduction to Hypertext markup language; Structure of HTML document; Head elements; Basic text formatting; Presentational elements; Phrase elements; Lists; Nested Lists; Tables; Hyperlinks; Images; Image maps; Forms; Frames.

Unit 3: Cascading Style Sheets (CSS)

6 hrs

Introduction; Internal style sheet; External style sheet; Controlling text; Text formatting; Selectors; Box Model; Backgrounds; Tables; Lists.

Unit 4: Java Script

10 hrs

Browser and document object; Scripts and HTML document. Programming Fundamentals: Variables, Expressions and evaluation, Operators, Data type conversion; Conditional statements; Loops; Functions. Built-in Objects: String, Date, Math, Array, Window; Events; Window and Document objects; Image object: Precaching images, Image rollovers; Forms and form elements; Form validation; Form enhancements.

Unit 5: Introduction to PHP/MYSQL


6 hrs

Introduction to PHP, Writing simple programs, data types, operators and expression, handling form with PHP, decision making, looping, working with MySQL.

References:

- Alexis Leon and Matews Leon, *Internet for Everyone*. New Delhi: Vikas Publishing house Pvt.Ltd.
Elizabeth Castro.(2006).*HTML, XHTML, and CSS:Visual QuickStart Guide* (6th ed.).
Harley Hahn. *Internet Complete Reference*.
Krayank ,Habraken. *Internet 6 in 1*.New Delhi :Prentice Hall of India Pvt.Ltd.

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VLSC13001: ANIMAL TISSUE CULTURE

Hours: 30

Course Objectives:

- To provide knowledge on history and techniques in animal cell culture.
- To understand the study of biochemical and physiological processes of the cell using various cell lines.
- To comprehend the basic information about the conditions of cell culture, cell line maintenance, passage and using of cell culture and tissues

Course outcomes:

After successful completion of the course, the student will be able to:

- Learn the essential laboratory technique on animal cell culture.
- Understand the knowledge on conditions of cell culture, cell passaging and cell viability assay and cryopreservation.

Unit 1: Introduction of Animal tissue Culture and Media preparation

8 hrs

Introduction, history and scope of Animal Biotechnology; terminologies in animal cell culture; Media constituents, physiochemical properties of a media, types of animal cell culture media: natural-plasma clot, biological fluids, tissue & embryo extracts. Importance of serum in media, artificial-chemically defined media, choice of medium and serum.

Unit 2: Cell lines and Culturing techniques

8 hrs

Isolation of tissue, Primary culture: disaggregation of tissue-enzymatic, mechanical, and primary explant technique; Secondary cultures- transformed cells and continuous cell lines; Cell lines and cloning.

Unit 3: Applications of Animal Cell Culture

8 hrs

Cancer Research, vaccine manufacture, gene and stem cell therapy, production of recombinant proteins, IVF Technology, toxicology studies.

Unit 4: Translational Research Applications

6 hrs

Rodent and murine models in scientific research associated with cancer and neurodegenerative diseases. Animal cells as the applicable products (recombinants, hybridomas, stem cells and transplants).

References:

Freshney, R.I. (2010). *Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications*. Wiley-Blackwell, 2010. 6th Edition.

Davis, J. M. (2008). *Basic Cell Culture*. Oxford University Press, New Delhi.

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VLSC13002 : LIFE SKILL EDUCATION FOR LIFE SCIENCE PROFESSIONALS

Hours: 30

Course Objectives:

- To develop communication competence in students and to enable them in conveying thoughts and ideas with clarity and focus with good writing skills.
- To equip them to face interview & Group Discussion.
- To inculcate critical thinking process and to prepare them on problem solving skills.

Course Outcomes:

After successful completion of the course, the student will be able to:

- Provide symbolic, verbal, and graphical interpretations of statements in a problem description.
- Understand team dynamics & effectiveness.
- Instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.
- Learn leadership qualities and practice them.

Unit 1: Writing and Reporting Skills

6 hrs

Technical Writing: Differences between technical and literary style, Elements of style; Common Errors, Letter Writing: Formal, informal and demi-official letters; business letters, Job Application: Cover letter, Differences between bio-data, CV and Resume, Report Writing: Basics of Report Writing; Structure of a report; Types of reports.

Unit 2: Communication and Presentation Skills

8 hrs

Interview Skills: Types of Interviews; Ensuring success in job interviews; Appropriate use of non-verbal communication, Group Discussion: Differences between group discussion and debate; Ensuring success in group discussions, Presentation Skills: Oral presentation and public speaking skills; business presentations, Technology-based Communication: Netiquettes: effective e-mail messages; power-point presentation; enhancing editing skills using computer software.

Unit 3: Group Problem Solving, Achieving Group Consensus

8 hrs

Steps in problem solving, Problem Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections. Problem Solving strategies. Group Dynamics techniques, Group vs Team, Team Dynamics, Teams for enhancing productivity, Building & Managing Successful Virtual Teams. Managing Team Performance & Managing Conflict in Teams. Working Together in Teams, Team Decision-Making, Team Culture & Power, Team Leader Development.

Unit 4: Morals, Values and Ethics

8hrs

Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character Spirituality, Senses of 'Engineering Ethics', variety of moral issues, Types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, Consensus and controversy, Models of Professional Roles, Theories about right action, Self-interest, customs and religion, application of ethical theories.

References:

Life Skills for Engineers, Compiled by ICT Academy of Kerala, McGraw Hill Education(India) Private Ltd., 2016.


Barun K. Mitra; (2011), "*Personality Development & Soft Skills*", First Edition; Oxford Publishers.

Larry James (2016); "*The First Book of Life Skills*"; 1st Edition; Embassy Books.

Shalini Verma (2014); "*Development of Life Skills and Professional Practice*"; 1st Edition; Sultan Chand (G/L) & Company.

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VLSC14002: RESEARCH METHODOLOGY

Hours: 30

Course Objective:

- To give knowledge and understanding of the essentials of research
- To comprehend on interpretation and research writing

Course Outcomes:

After completing the course students will be able to:

- learn about designing of experiments for research
- get to know the systematic way of interpreting results
- acquire knowledge on report writing and paper publication

Unit 1: Research Methodology

10 hrs

Meaning, Basic and applied research, Essential steps in research, Defining the research problem, Research/Experimental design, Research and Scientific Methods; Literature collection, Significance of research.

Unit 2: Interpretation and Report Writing

10 hrs

Meaning of interpretation; Techniques of interpretation; Precautions in Interpretation; Synopsis/Dissertation/Thesis/Report/Abstract/Manuscript/Review/Project/writing: Meaning, concept, objectives and scope, components, format, types, layout, different steps involved, Significance and Bibliography


Unit 3: Publications and Statistical Analysis

10 hrs

Publishing research articles in Journals, Books, Proceedings. Citation Index, Impact factor, Abstract Index, Oral and Poster presentation. Statistical Methods: Collection and presentation of Data (Tables, Graphs, Diagrams). Standard deviation and standard error.

References:

- Kumar K. L.' (1997), *Educational Technology*, New Age International (P) Ltd., New Delhi.
Kothari, C.R; II ed. (2004), *Research Methodology*, Methods and techniques; New Age International (p) Ltd., Publishers, New Delhi.
Jerrald H. Zar (1999), *Biostatistical analysis of Prentice Hall International, Inc. Press*, London
Tony Bates A.W. Technology, (2005), *e-Learning and Distance Education*, New York, Routledge.

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VLSC16001: ESSENTIALS OF FOOD MICROBIOLOGY

Hours: 30

Course Objectives:

- To understand the mechanism of processing of milk and milk products.
- To understand the different types of packaging and distribution of food products.
- To familiarize food spoilage, preservation and regulations in food industry.

Course Outcomes:

After successful completion of the course, the student will be able to:

- Learn the importance of food and nutritive value of milk.
- Understand the processing of various dairy and meat products.
- Acquire an elementary knowledge and understand the relevance of microscopy and its applications in everyday life.
- Develop an understanding of the role of microorganisms in food industry and in the maintenance of health.

Unit 1: Milk and Milk Products

08 hrs

Processing – Pasteurization, cryogenic cooling, instantization of milk; Factors affecting milk selection – Physiological factors, nutritional factors, sensory factors; Functional – denaturation, coagulation, gelation, foaming and browning; Nutrition – nutrition in milk as a significant factor; Preservation; Quality assessment. Processing - cream, butter, condensed milk, evaporated milk, whole and skimmed milk powder; Fermented milk products-Instantization of milk products.

Unit 2: Food Product and Processing

08 hrs

Mechanical separation – filtration, membrane concentration, sieving, centrifugation, sedimentation; Mechanical handling – conveying, elevation, size reduction, classification-mixing, kneading, blending; Processing of chocolate, cocoa, cocoa butter, vegetables, fruits, raw and refined sugar, fish, meat, fats and oils, fat substitutes and low-calorie foods.

Unit3:Microorganisms in Foods and Preservation methods

08 hrs

Microorganisms in Foods and methods for detection-Culture, Microscopic and Sampling Method for detecting microbes, Food Preservation & Principles of Quality Control: Chemicals antibiotics, Radiation, Low and high temperature, High-Pressure Processing Pulsed Electric Fields. Aseptic Packaging, thermosonication, Microbiological quality standards of food, FDA, HACCP, ISI. Microbial Food Spoilage and Food borne diseases.

Unit 4: Food Adulteration and Regulation

06 hrs

Food adulteration and food safety, HACCP; Sensory evaluation – introduction, panel screening; Instrumental analysis in quality control; FSSAI; Optimum nutrition requirements (WHO), additives in food processing and preservation – functions, safety, colours, flavours, sweeteners, acidulants.

References:

- M.R. Adams and M.O. Moss, *Food Microbiology*, New Age International (P) Ltd., New Delhi, 2005.
VijayaRamesh, K. *Food Microbiology*, MJP Publishers, Chennai, 2007

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Course Objectives:

- To understand basic methodologies of plant tissue culture
- To familiarize on using biotechnological tools in creating transgenics and its application in crop improvement

Course outcomes:

After successful completion of the course, the student will be able to:

- Learn about Plant tissue culture techniques and preservation methods
- Understand the different modes of gene transfer in Plant tissue culture
- Know the various applications in agriculture for crop improvement

Unit 1: Plant Cell and Tissue Culture

05 hrs

Plant tissue culture media, Micropropagation; organogenesis, somatic embryogenesis; Protoplast isolation, somatic hybridization; Haploid production; Somoclonal variation; Cryopreservation

Unit 2: Gene Transfer in Plants

08 hrs

Marker genes-reporter genes; selectable markers; Gene transfer methods – Vector or *Agrobacterium* mediated gene transfer - Plasmid vectors -Virus mediated gene transfer; Physical methods and Chemical methods.

Unit 3: Applications of technology in Agriculture

08 hrs

Bio fertilizer - Cultivation and mass production of bio inoculants- *Azotobacter*, *Rhizobium*, *Azospirillum*, Cyanobacteria, phosphate solubilizing microorganisms, *Azolla*; Bio pesticides– types and applications-*Pseudomonas fluorescens*, *Bacillus thuringiensis*, *Trichoderma harzianum*, *Trichoderma viride*. Vermicomposting. Terminator Gene technology.

Unit 4: Crop Improvement using Transgenic Technology

09 hrs

Role of biotechnology in crop improvement; Herbicide resistance in commercially important plants; Insect resistance by Bt genes (*cry* genes) and protease inhibitor genes; Male sterile plants, methods of inducing male sterility, its importance in breeding.

References:

- Agrios A.G., (2006). *Plant Pathology*, Elsevier Academic Press, New Delhi.
- Altman A. and Hasegawa, P.M., (2011). *Plant biotechnology and Agriculture – Prospects for the 21st Century*, Elsevier Science Publishers, Amsterdam.
- Bhojwani, S.S. and Razdan, M.K. (1983), *Plant tissue culture: Theory and Practice*, Elsevier Science Publishers, Amsterdam.
- Gamborg O.L. and Philips G.C., (1998). *Plant cell, tissue and organ culture*, Narosa Publishing House, New Delhi.
- Kalyan Kumar De, (2001). *An introduction to plant tissue culture*. New Central Book Agency (P) Ltd., Kolkata.

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VLSC17001: ESSENTIALS OF ANIMAL BIOTECHNOLOGY AND CELL CULTURE

Hours: 30

Course Objectives:

- To understand the knowledge on design and equipment of animal cell culture
- To familiarize on the basic principles of animal cell culture
- To know the applications of animal biotechnology

Course Outcomes:

After successful completion of the course, the student will be able to:

- Provide the necessary theoretical knowledge on cell lines for *in vitro* studies.
- Knowledge on maintenance of animal cells and tissues *in vitro*.
- Understand the manipulation of animal cells *in vitro* and application of molecular techniques.

Unit 1: Animal Tissue Culture Laboratory

05 hrs

Layout of ATC lab; Essential equipment– working principle and uses of biosafety cabinet, CO₂ incubator, inverted microscope.

Unit 2: Animal Cell Culture

10 hrs

Natural media; Synthetic media – composition and functions of components; Serum and protein-free defined media – advantages, disadvantages and applications; Primary culture methods- explants, single and double coverslip methods; Enzymatic, chemical and mechanical disaggregation of tissue; Technique of subculture; Cell lines –characteristics and applications of CHO, BHK, HeLa and WI 38 lines.

Unit 3: Applications of Animal Biotechnology

10 hrs

Analysis of cell viability and cytotoxicity – Dye exclusion and inclusion tests, plating efficiency, recovery index, metabolic assays (MTT assay); Transgenic Animals – Concept, methods of production, importance of transgenic animals - improved desired characters, increased productivity and of domestic animals, production of proteins for pharmaceutical use, animal models for tackling human diseases. Vaccine production using animal cell lines.


Unit 4: Embryo transfer and *in vitro* Techniques

05 hrs


Reproductive cycles in cattle and human; Hormonal control of reproduction in mammals; Embryo transfer technology and *in vitro* fertilization in cattle; *in vitro* fertilization in humans.

References:

- Ballnic C.A., Philips J.P and Moo Young M, (1989). *Animal Biotechnology*, Pergamon.
Butler, M., (2006). *Animal Cell Culture and Technology*, Bios, Oxford, UK.
Cheryl, D.H. and Cyndi, L.M. (2005). *Basic cell culture protocols*, Humana press, New Jersey.
Davis John. M. (2011). *Animal Cell Culture Essential Methods*, Wiley-Blackwell, Sussex, UK.
Glick B.R and Pasternak J.J., (1998). *Molecular Biotechnology*, ASM Press, Washington DC.
Ian Freshney R., (2005). *Culture of Animal Cells – a manual of basic technique* (5th Ed.), John Wiley and Sons, New York.
Jenkins, N., (1999). *Animal Cell Biotechnology*, Humana Press, New Jersey.
Jenni.P., Mather and David Barnes, (2001). *Methods in Cell Biology*, Academic Press, New York.

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VLSC17002: ESSENTIALS OF ENVIRONMENTAL MICROBIOLOGY

Hours: 30

Course Objectives:

- To understand the role of microorganisms as agents of environmental change.
- To recognize microorganisms as indicators of alteration of an ecosystem.
- To understand microbial processes aimed to solve environmental problems.

Course Outcomes:

After successful completion of the course, the student will be able to:

- Apply knowledge of the biology and distribution of certain species of microorganisms, to use them as bioindicators of contamination and other environmental impacts.
- Understand the metabolic processes of microorganisms to industrial processes related to the environment.

Unit: 1 Microbial ecology

6 hrs

Microbial ecology-basic concepts, types and microbial habitats, factors affecting microbial population. Microbial interactions: competition, commensalism, parasitism, mutualism, commensalisms, synergism. Population ecology: characteristics of population, population growth curves(r and k selection) population regulation. Conservation and management of microbial diversity: biodeterioration and biodegradation

Unit: 2 Soil microbiology

6 hrs

Microflora of soil: soil microorganisms associated with plants: rhizosphere, mycorrhizae. Role of microorganisms in organic matter decomposition (cellulose, hemi cellulose, lignin). Bioleaching; introduction, application of bacterial leaching techniques, properties of bioleaching. Microbial degradation of xenobiotics, petroleum and oil spills in environmental decay behaviours and degradative plasmid.

Unit: 3 Water microbiology

6 hrs

Aquatic microorganisms; fresh water and sea water microflora. Microorganisms and water quality, water pollution. Water purity test and indicator organisms, method used in environmental studies-BOD, COD, DO. Common water born disease and their control measure. Water purification: flocculation, chlorination and purification.

Unit: 4 Air Microbiology

6 hrs

Microorganism of air, enumeration of air micro flora. Significance of air micro flora. Brief account of air borne transmission of bacteria, fungi, pollens and viruses. Air borne diseases and their prevention.

Unit: 5 Biotechnological Approach for Improving the Environment

6 hrs

Characteristics of industrial effluents, Conventional treatments, Bioremediation, Kinetics of biodegradation of waste, Advances in aerobic and anaerobic treatments Genetically modified organisms for improving the environment Techno-economic feasibility of conversion of waste into energy.

References:

Ronalds M, Atlas, *Microbial Ecology: Fundamentals and applications*, 4th edition, An imprint of Addison Wesley Longman. Inc, California.

SoliJ Arceivala, *Wastewater Treatment for Pollution Control*, 2nd Edition, Tata McGraw-Hill Publishing Company Limited.

Gareth M. Evans and Judith C. Furlong, *Environmental Biotechnology Theory and Application*, John Wiley and Sons, LTD, U.S.A.

Verified,
Dr. Deep Francis
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h/z


DEAN

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