

Bachelor of Technology - Biotechnology

Syllabus – First Semester

INTRODUCTION TO COMPUTERS AND PROGRAMMING IN C

Course Code: BTE2104

Credit Units: 03

Course Objective:

The objective of this course module is to acquaint the students with the basics of computers system, its components, data representation inside computer and to get them familiar with various important features of procedure oriented programming language i.e. C.

Course Contents:

Module I: Introduction

Introduction to computer, history, von-Neumann architecture, memory system (hierarchy, characteristics and types), H/W concepts (I/O Devices), S/W concepts (System S/W & Application S/W, utilities). Data Representation: Number systems, character representation codes, Binary, octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

Module II: Programming in C

History of C, Introduction of C, Basic structure of C program, Concept of variables, constants and data types in C, Operators and expressions: Introduction, arithmetic, relational, Logical, Assignment, Increment and decrement operator, Conditional, bitwise operators, Expressions, Operator precedence and associativity. Managing Input and output Operation, formatting I/O.

Module III: Fundamental Features in C

C Statements, conditional executing using if, else, nesting of if, switch and break Concepts of loops, example of loops in C using for, while and do-while, continue and break. Storage types (automatic, register etc.), predefined processor, Command Line Argument.

Module IV: Arrays and Functions

One dimensional arrays and example of iterative programs using arrays, 2-D arrays Use in matrix computations.

Concept of Sub-programming, functions Example of user defined functions. Function prototype, Return values and their types, calling function, function argument, function with variable number of argument, recursion.

Module V: Advanced features in C

Pointers, relationship between arrays and pointers Argument passing using pointers, Array of pointers. Passing arrays as arguments.

Strings and C string library.

Structure and Union. Defining C structures, Giving values to members, Array of structure, Nested structure, passing strings as arguments.

File Handling.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- “ANSI C” by E Balagurusamy
- Yashwant Kanetkar, “Let us C”, BPB Publications, 2nd Edition, 2001.
- Herbert Schildt, “C: The complete reference”, Osbourne Mcgraw Hill, 4th Edition, 2002.
- V. Raja Raman, “Computer Programming in C”, Prentice Hall of India, 1995.

References:

- *Kernighan & Ritchie, “C Programming Language”, The (Ansi C Version), PHI, 2nd Edition.*
- *J. B Dixit, “Fundamentals of Computers and Programming in ‘C’.*
- P.K. Sinha and Priti Sinha, “Computer Fundamentals”, BPB publication.

PROGRAMMING IN C LAB

Course Code: BTE2108

Credit Units: 01

Software Required: Turbo C

Course Contents:

- C program involving problems like finding the nth value of cosine series, Fibonacci series. Etc.
- C programs including user defined function calls
- C programs involving pointers, and solving various problems with the help of those.
- File handling

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab Record, V – Viva.

Syllabus – Second Semester

OBJECT ORIENTED PROGRAMMING IN C++

Course Code: BTE2203

Credit Units: 03

Course Objective:

The objective of this module is to introduce object oriented programming. To explore and implement the various features of OOP such as inheritance, polymorphism, Exceptional handling using programming language C++. After completing this course student can easily identify the basic difference between the programming approaches like procedural and object oriented.

Course Contents:

Module I: Introduction

Review of C, Difference between C and C++, Procedure Oriented and Object Oriented Approach. Basic Concepts: Objects, classes, Principals like Abstraction, Encapsulation, Inheritance and Polymorphism. Dynamic Binding, Message Passing. Characteristics of Object-Oriented Languages. Introduction to Object-Oriented Modeling techniques (Object, Functional and Dynamic Modeling).

Module II: Classes and Objects

Abstract data types, Object & classes, attributes, methods, C++ class declaration, Local Class and Global Class, State identity and behaviour of an object, Local Object and Global Object, Scope resolution operator, Friend Functions, Inline functions, Constructors and destructors, instantiation of objects, Types of Constructors, Static Class Data, Array of Objects, Constant member functions and Objects, Memory management Operators.

Module III: Inheritance

Inheritance, Types of Inheritance, access modes – public, private & protected, Abstract Classes, Ambiguity resolution using scope resolution operator and Virtual base class, Aggregation, composition vs classification hierarchies, Overriding inheritance methods, Constructors in derived classes, Nesting of Classes.

Module IV: Polymorphism

Polymorphism, Type of Polymorphism – Compile time and runtime, Function Overloading, Operator Overloading (Unary and Binary) Polymorphism by parameter, Pointer to objects, this pointer, Virtual Functions, pure virtual functions.

Module V: Strings, Files and Exception Handling

Manipulating strings, Streams and files handling, formatted and Unformatted Input output. Exception handling, Generic Programming – function template, class Template Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterators, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:

Text:

- A.R. Venugopal, Rajkumar, T. Ravishanker “Mastering C++”, TMH, 1997

- R. Lafore, “Object Oriented Programming using C++”, BPB Publications, 2004.
- “Object Oriented Programming with C++” By E. Balagurusamy.
- Schildt Herbert, “C++: The Complete Reference”, Wiley DreamTech, 2005.

References:

- Parsons, “Object Oriented Programming with C++”, BPB Publication, 1999.
- Steven C. Lawlor, “The Art of Programming Computer Science with C++”, Vikas Publication, 2002.
- Yashwant Kanethkar, “Object Oriented Programming using C++”, BPB, 2004

OBJECT ORIENTED PROGRAMMING IN C++ LAB

Course Code: BTE2205

Credit Units: 01

Software Required: Turbo C++

Course Contents:

- Creation of objects in programs and solving problems through them.
- Different use of private, public member variables and functions and friend functions.
- Use of constructors and destructors.
- Operator overloading
- Use of inheritance in and accessing objects of different derived classes.
- Polymorphism and virtual functions (using pointers).
- File handling.

Examination Scheme:

IA				EE	
A	PR	LR	V	PR	V
5	10	10	5	35	35

Note: IA –Internal Assessment, EE- External Exam, PR- Performance, LR – Lab

Syllabus – Third Semester

BIOSTATISTICS

Course Code: BTE2303

Credit Units: 03

Course Objective:

The course aims to develop competency and expertise in the application of statistical methods applied to biological data obtained in experimental techniques, methodology and the safe laboratory practice.

Course Contents:

Module I

Statistics and Biostatistics: Preliminary concepts; Measures of Central Tendency: Mean, Median, Mode
Measures of Dispersion: Range, Standard deviation, Variance

Module II: Probability

Random Experiments, Trial and Event, Sample Space, Mutually Exclusive or Disjoint Events, Mutually Exhaustive Events, Equally Probable Events, Complementary Event, Classical definition of Probability, Statistical definition of Probability, Axiomatic definition of Probability, Addition theorem, Multiplication theorem, Conditional Probability, Bayes' Theorem. Expectation.

Module III: Continuous Distribution

Normal Distribution, Properties of Normal distribution

Module IV: Correlation

Bivariate distribution Correlation, Types of Correlation, Simple Correlation Coefficient for ungrouped data, Properties and Interpretation of Correlation Coefficient, Coefficient of determination, Scatter diagram, Standard Error, Probable error of Correlation Coefficient. Rank correlation, Some examples.

Module V: Regression

Definition, Regression lines and Regression Coefficients, Properties of Regression Coefficients, Some examples. Method of least square: Fitting of straight line

Module VI: Introduction to the following Statistical terms

Parameter, Statistic, Null hypothesis, Alternative hypothesis, Critical region, Type1 Error, Type 11 Error, Level of significance, P-value and its applications.

Test of Significance for Small samples: One sample t-test, Paired t-test, Degrees of freedom for t-test, F test for equality of Population variances, Degrees of freedom for F-test.

Test of Significance for Large samples: Normal test for sample mean and population mean, Normal test for two sample means.

Chi-square Test: Test of goodness of fit, Test of Independence of attributes, Degrees of freedom for Chisquare test, Coefficient of contingency, Yates' correction for continuity.

Analysis of Variance: One way and Two way (only Examples)

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Introduction to Biostatistics, Ronald N. Forthfer and Eun Sun Lee, Publisher: Elsevier.
- Statistical Methodology, S.P. Gupta, Publisher: S. Chand & Co.
- Fundamentals of Statistics, S.C. Gupta. Publisher: S.Chand & Co.

References:

- Biostatistics: A manual of Statistical Methodology for use in Health, Nutrition and Anthropology, K. Visweswara Rao. Publisher: Jaypee Brothers Biostatistics: A foundation for analysis in the Health Sciences, W.W. Daniel, Publisher: John Wiley and Sons
- Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Publisher: S.Chand & Co.
- Statistical Analysis, Kaushal, T.L. Publisher: Kalyani Publishers
- Statistical Methods, Potri, D. Kalyani Publishers.
- Mathematical Statistics, H.C. Saxena, and V.K. Kapoor: S. Chand & Company
- Biostatistics, P.N. Arora and P.K. Malhan, Publisher: Himalaya Publishing House.

DATABASE MANAGEMENT SYSTEM

Course Code: BTE2304

Credit Units: 02

Course Objective:

It enables the students to access biological information networks and databases in order to understand the different techniques of biotechnology to build detection systems especially in the prevention and treatment of human diseases.

Course Contents:

Module I: Overview and historical perspective

File systems vs. DBMS, advantages of DBMS

Module II: Describing and storing data in DBMS

Levels of abstraction and data independence; Data models and their comparison; Entity relationship model -concepts, design, keys and features; Relational model -introduction, structure of the relational databases, integrity constraints, Relational algebra and calculus -selection and projection, set operations, renaming, Joins, Division etc.

Module III: SQL and Perl

Module IV: Database design

Functional dependencies, Normal forms; Concurrency control and database discovery -concept of transaction: atomicity, consistency, isolation and durability, transactions and schedules, concurrent execution of transactions, Lock based concurrency control, Database recovery

Module V: Current trends

Distributed databases and multimedia databases;

Module VI: Data warehousing and Data Mining

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Data Mining: Concept and techniques, J. Han and M. Kamber, Morgan Kaufman.
- Database Management, P.C. Desai.

References:

- Introduction to Database Systems, C.J. Date, Addison Wesley Publishing.
- Data Mining, A.K. Pujari, Sangam Books Ltd.
- Principles of Database and Knowledge Based systems, J.D. Ullman, Computer Science Press.
- The Data Warehouse Lifecycle Toolkit, John Wiley and Sons Inc.
- The Data Warehouse Toolkit, R. Kimball et al, John Wiley and Sons Inc.

DATABASE MANAGEMENT SYSTEMS LAB

Course Code: BTE2308

Credit Units: 01

Course Contents:

Module I

Database creation using DDL and DML.

Module II

Defining the primary and secondary keys.

Module III

Implementation of selection, projection and joins (internal and external) with SQL and Perl .

Module IV

Normalization of databases with SQL and Perl

Module V

Implementation of transactions and schedules.

Module VI

Detection of association rules and knowledge recovery.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

Note: Minor variation could be there depending on the examiner

INDUSTRIAL BIOTECHNOLOGY

Course Code: BTE2309

Credit Units: 02

Course Objective:

The objective of this course is to use microorganism to produce various compounds of commercial interest. The student will be exposed to various techniques available for large scale cultivation of microorganisms.

Course Contents:

Module I

Introduction to fermentation, the fermentation industry, Production process batch and Continuous system of cultivation, Solid-state fermentation

Module II

Selection of industrial microorganisms, media for fermentation, aeration, pH, temperature and other requirements during fermentation, downstream processing and product recovery, food industry waste as fermentation substrate.

Module III

Production of compounds like, antibiotics, enzymes, organic acids, solvents, beverages, SCP.

Module IV

Production of fermented dairy products

Module V

Immobilized enzymes systems, production and applications.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Industrial Microbiology – Cassida

References:

- Principles of fermentation Technology, Salisbury, Whitaker and Hall
- Industrial microbiology – Prescott & Duhn.

FERMENTATION TECHNOLOGY

Course Code: BTE2310

Credit Units: 02

Objective of the course is for the acquaintance of large scale cultivation of microbes for production of industrially important products.

Course Contents

Module I: Fermentation Technology-An Overview

Development and overview of fermentation processes, strain development, media design and optimization, commercial media for fermentation

Module II: Bioproduct Production

Production of Organic acids: citric acid, acetic acid, lactic acid

Production of ethanol

Production of Antibiotics: penicillins, tetracyclins, chloramphenicol

Production of Recombinant products

Production of Industrial enzymes: cellulase, amylase, protease

Production of vitamins: B₁₂, riboflavin, fermented dairy products.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & references:

Text:

- Principles of Fermentation Technology by P.F. Stanbury, A. Whitaker, and S.J. Hall, Aditya Books (P) LTD.
- *Industrial Microbiology* by L.E. Casida, JR. New Age International (P) LTD.
- *Biotechnology, A Text book of Industrial Microbiology*, W. Crueger and A. Crueger, Sinauer Association.

References:

- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker
- Biochemical Engineering Fundamentals, J.E. Bailey and D.F. Ollis, McGraw-Hill
- Protein Purification, M.R. Ladisch, R.C. Wilson, C.C. Painton and S.E. Builder, American Chemical Society

DRUG DESIGN AND DEVELOPMENT

Course Code: BTE2311

Credit Units: 02

Course Objective:

The above course will be aimed to identify and design drugs that could be potentially useful in the identification of the candidate drugs, which have efficacy in cell culture or animal models, and thus the most effective compounds could be employed based on the above results for being moved through preclinical studies to clinical trials.

Course Contents:

Module I: Drug targets classification

DNA, RNA, post-translational, processing enzymes, metabolic enzymes involved in nucleic acid synthesis, G-protein coupled receptors (monomeric transmembrane proteins), small molecule receptors, neuropeptide receptors, ion channels (monomeric multi-transmembrane) proteins, ligand-gated ion channels (oligomeric transmembrane proteins), transporters (multi-transmembrane proteins).

Module II: Target discovery and validation strategies

Genomics (new target discovery), biological activity directed and other types of screening, natural products, combinatorial chemistry; General overview of validation techniques.

Module III: Structure-based design

Drug design to discovery and development, drug metabolism, toxicity and pharmacokinetics, toxicology considerations, problems and drawbacks on drug discovery and development.

'de novo' design methodologies : indirect drug design, pharmacophore development and receptor mapping, combinatorial libraries and new strategies and recent technologies in drug design.

Module IV: Basic concepts of Drug Delivery

Introductory lecture (1-2), Concepts of Bio availability, Process of drug absorption, Pharmacokinetic processes, Timing for optimal therapy, Drug delivery considerations for the new biotherapeutics

Basic terminologies in drug delivery and drug targeting, Drug release, Drug targeting, Doses forms, Various routes of administration of drugs (just introduction), Strategies for enhanced therapeutic efficacies (Basic principles)

Module V: Delivery of Genetic material

Basic principles of gene expression, Viral and nonviral vectors in gene delivery, Clinical applications of gene therapy and antisense therapy

New generation technologies in Drug delivery and targeting

Nanotechnology / Nanobiotechnology, Use of biosensors and challenge of chronopharmacology, Microchips and controlled drug delivery, genetically engineered cell implants in drug deliver.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Drug Delivery and Targeting, A.M. Hillery, A.W. Lloyd and J. Swarbrick, Harwood Academic Publisher
- Pharmaceutical Dosage Forms and Drug Delivery Systems, H.C. Ansel, L.V. allen and N.G. Popovich, Lippincott Williams and Wilkins Publisher

References:

- Introduction to Biophysical Methods for Protein and Nucleic Acid Research, J.A. Glasel and M.P. Deutscher, Academic Press.
- Principles of Drug Action, W.B. Pratt and P. Taylor, Churchill Livingstone.
- Principles of Medicinal Chemistry, W.O. Foye, T.L. Lemke, and D.A. Williams, Williams and Wilkins
- Side Effects and Drug Design, E.J. Lien, Marcel Dekker.
- The Anticancer Drugs, W.B. Pratt, R.W. Ruddon, W.D. Ensminger, and J. Maybaum, Oxford University Press.

RECOMBINANT DNA TECHNOLOGY

Course Code:BTE2312

Credit Units: 02

Course Objective:

A complete understanding of molecular techniques like DNA sequencing, restriction mapping, PCR for the cloning and expression of genes can be obtained through the course.

Course Contents:

Module I

Purification of DNA from bacterial, plant and animal cells, manipulation of purified DNA.

Module II

Introduction of DNA into living cells

Module III

Introduction to gene cloning and its uses, tools and techniques: plasmids and other vectors, DNA, RNA, cDNA.

Module IV

Production of proteins from cloned genes: gene cloning in medicine (Pharmaceutical agents such as insulin, growth hormones, recombinant vaccines), gene therapy for genetic diseases.

Module V

Analysis of DNA by Southern blotting, Analysis of RNA by Northern blotting, Analysis of proteins by Western blot techniques, Dot blots and slot blots, RFLP, AFLP.

PCR: Basic principles and its modification application and uses.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Gene cloning and DNA analysis by T.A. Brown

References:

- Recombinant DNA, J.D. Watson et al, W.H. Freeman and Company
- Principles of Gene Manipulation: An Introduction to Genetic Engineering, R.W. Old and S. B Primrose, Blackwell Science Inc
- Molecular Biotechnology: Principles and Applications of Recombinant DNA, B.R. Grick and J.J. Pasternak, ASM Press
- Molecular Biology of gene by Watson, Baker, Bell, Gann, Levine, Losick
- DNA Science by Micklos Freyer
- Principles of Gene manipulation and Genomics by Primrose and Twyman

TERM PAPER

Course Code: BTE2331

Credit Units: 02

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

1. Choosing a subject
2. Finding sources of materials
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

- a) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- b) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- c) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- a) Get facts, not just opinions. Compare the facts with author's conclusion.
- b) In research studies, notice the methods and procedures, results & conclusions.
- c) Check cross references.

4. Outlining the paper

- a) Review notes to find main sub-divisions of the subject.
- b) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

- a) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section

may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.

- b) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- c) Check for proper spelling, phrasing and sentence construction.
- d) Check for proper form on footnotes, quotes, and punctuation.
- e) Check to see that quotations serve one of the following purposes:
 - (i) Show evidence of what an author has said.
 - (ii) Avoid misrepresentation through restatement.
 - (iii) Save unnecessary writing when ideas have been well expressed by the original author.
- f) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- 1) Title page
- 2) Table of contents
- 3) Introduction
- 4) Review
- 5) Discussion&Conclusion
- 6) References
- 7) Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- a) summary of question posed
- b) summary of findings
- c) summary of main limitations of the study at hand
- d) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

Edited Volumes

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), *Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea*. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. *Journal of consumer research* 19, 180-197.

Electronic Book

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

Electronic Journal Articles

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal* [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

Other Websites

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

Unpublished Papers

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations

Möhl, S. (1996), *Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen*. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), *Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language*. Unpublished PhD dissertation, University College Dublin.

Appendix

The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation:

40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

Final Evaluation:

60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

PROJECT

Course Code: BTE2332

Credit Units: 02

Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) Body of the Report: The body of the report should have these four logical divisions

a) **Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b) **Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).

c) **Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).

d) **Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic

- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV: Writing the report dividing it into suitable chapters, viz.,

Chapter 1: Introduction,

Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

Step V: The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)

2) Student's declaration (Annexure-IB)

3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

WORKSHOP / CERTIFICATION

Course Code: BTE2333

Credit Units: 02

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

Accounting

Finance

Human Resources

Marketing

Economics

Operations

Supply Chain Management

These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:

Relevant study material and references will be provided by the trainer in advance.

The participants are expected to explore the topic in advance and take active part in the discussions held

Attending and Participating in all activities of the workshop

Group Activities have to be undertaken by students as guided by the trainer.

Evaluation of workshop activities would be done through test and quiz at the end of the workshop.

Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

Case Study

Business Game

Simulation

Group Activity

Role Play

Business Planning

Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

Syllabus – Fourth Semester

MICROBIOLOGY LAB

Course Code: BTE2406

Credit Units: 02

Course Contents:

1. Preparation of solid and liquid media.
2. Isolation and maintenance of organisms by plating, streaking and serial dilution.
3. Preparation of slant cultures.
4. Growth curve measurement of bacterial population by turbidometry.
5. Measurement of bacterial population by dilution method.
6. Effect of temperature, pH, carbon and nitrogen sources on growth of bacteria.
7. Microscopic examination of bacteria by gram staining.
8. Endospore staining.
9. Capsule staining.
10. Isolation and identification of Rhizobium from root nodules.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

DATA STRUCTURE & ALGORITHMS LAB

Course Code: BTE2407

Credit Units: 01

Course Contents:

Module I

Stack implementation through arrays, link list

Module II

Programs for recursion functions

Module III

Implementation of queues and heap structures

Module IV

Application of binary trees in pre-order, post-order and in-order evaluation

Module V

A VL tree implementation

Module VI

Optimal matrix multiplication

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

ENZYMOLGY AND ENZYME TECHNOLOGY LAB

Course Code: BTE2408

Credit Units: 01

Course Objective:

The laboratory will help the students to isolate enzymes from different sources, enzyme assays and studying their kinetic parameters which have immense importance in industrial processes.

Course Contents:

Module I

Isolation of enzymes from plant and microbial sources.

Module II

Enzyme assay; activity and specific activity – determination of amylase, nitrate reductase, cellulase, protease.

Module III

Purification of Enzyme by ammonium sulphate fractionation.

Module IV

Enzyme Kinetics: Effect of varying substrate concentration on enzyme activity, determination of Michaelis-Menten constant (K_m) and Maximum Velocity (V_{max}) using Lineweaver-Burk plot.

Module V

Effect of Temperature and pH on enzyme activity.

Module VI

Enzyme immobilization

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

Text & References:

Text:

- *Practical Biochemistry, Sawhney and Singh*

References:

- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker

METHODS AND INSTRUMENTATION IN BIOTECHNOLOGY LAB

Course Code: BTE2409

Credit Units: 01

Course Contents:

Module I

Cell disruption techniques

Module II

Centrifugation – low speed and high speed.

Module III

Spectrophotometer techniques

Module IV

Chromatography –Paper Chromatography and Thin Layer Chromatography

Module V

Electrophoresis –SDS Page and Agarose gel electrophoresis.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

MARINE BIOTECHNOLOGY

Course Code: BTE2410

Credit Units: 02

Course Objective

The students will be exposed to basic concepts related to marine life. Also the subject deals with the scope and application of marine biota in biotechnology.

Course Contents

Module I

The marine ecosystem and its functioning: intertidal, estuarine, salt marsh, mangrove, coral reef, coastal & deep sea ecosystems. Marine viruses, Bacteria and their significance; Hydrothermal vents; Marine Biodiversity: defining, measurement and conservation strategies.

Module II

Nutrients cycling: carbon, nitrogen sulphur & phosphorus.

Global climate changes: impact on species diversity & productivity, oceans as a carbon sink, effects on corals bleaching. Biological rhythms.

Module III

Important Marine Products: Bioactive compounds from marine organisms, GFP, RFP characteristics and their applications; Green mussel adhesive protein, Chitosan and its applications

Module IV

Probiotic bacteria and their importance in aquaculture; Vaccines in aquaculture: Fish, shrimps & prawns; Marine food analysis-spoilage, quality control; Techniques for identification of bacterial & viral pathogens in aquaculture and Remedies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Biodiversity (2004) Borua, P.K
- Text book of Marine Ecology (1989). Nair N.B. & Thampy, D.M.
- Drugs from sea. (2000). Fusetani, N.
- Microbiology of deep sea hydrothermal vents. (1995). Karl, D.M.
- The search from bioactive compounds from microorganisms. (1992). Omum, S.
- Recent Advances in Marine Biotechnology. Vol.2 (1998) Fingerman, M., Nagabushanam, R., Thompson, M.
- Recent Advances in Marine Biotechnology Volume 3 – Milton fingerman et al., 1999.
- Environmental Biotechnology – Gareth M.Evams et al., 2003
- Biotechnology, Recombinant DNA Technology, Environmental Biotechnology – S.Mahesh et al., 2003.

VACCINE DEVELOPMENT

Course Code: BTE2411

Credit Units: 02

Course Objective

The students will be exposed to basic concepts related with development of vaccines.

Course Contents

Module I

History of Vaccine Development

Definition of Vaccine

Evolution of Vaccines

Module II

Process development for vaccines

Manufacturing of vaccines

Various aspects of vaccines, process development and manufacturing

Module III

Clinical development of vaccines

Clinical end-point: Evolution of vaccines

General specifications and pharmaceuticals release criteria for the existing vaccines

Cold chain management of vaccines

Current vaccine research

Examination Scheme:

Components	H/S	A	CT	EE
Weightage (%)	10	5	15	70

Text & Reference

- Vaccines, 4th Edition by Stanley A. Plotkin, Elsevier publication
- Vaccines and Immunotherapy by Stanley J. Cryz Elsevier science publishing co.
- Journal articles and reviews

AGRICULTURAL BIOTECHNOLOGY

Course code: BTE2412

Credit Units: 02

Course Objective:

The agriculture plant biotechnology course basically meant for understanding the basic techniques of plant tissue culture and genetic engineering in plants along with the latest ongoing research on the different aspects of plants and its products to redefine agriculture priorities and produce human resource with academic, scientific and technical expertise along with management or business experience.

MODULE I Plant Regeneration Technologies

Introduction and historical perspective, organ culture, cell suspension, organogenesis, somatic embryogenesis, micropropagation, anther and ovary culture-haploid production, embryo culture and rescue, protoplast culture, somatic hybridization and cybrids.

MODULE II Transgenic Plants Technology

Genetic Transformation, Methods for gene transfer in plants, Molecular mechanism of *Agrobacterium* mediated transformation. Selectable markers, Reporter gene and Promoters used in plant transformation vectors.

MODULE III Industrial and Agricultural Application

Biotic stress tolerance; insect, pest and pathogen resistance. Abiotic stress tolerance; salt, water and drought tolerance. Herbicide tolerance. Molecular farming

Examination Scheme:

Components	H/S	A	CT	EE
Weightage (%)	10	5	15	70

References

1. Plant Biotechnology: The Genetic Manipulation of Plants. A. Slater, N. W. Scott and M. R. Fower.2008. Oxford University Press
2. Recent Advances in Plant Biotechnology: Ara Kirakosyan and Peter B. Kaufan. 2009. Springer
3. Plant Tissue Culture: Theory and Practice. S.S. Bhojwani and M.K.Razdan. Elsevier Health Science
4. An Introduction to Plant Tissue Culture. M.K. Razdan. Oxford and IBH Publishing.

STEM CELL TECHNOLOGY

Course Code: BTE2414

Credit Units: 02

Course Objective: The objective of this paper is to familiarize the students with stem cell technology and its applications for betterment of the society. The course is designed to give a broad view of mammalian stem cells, reviewing where they are found in the body, the different types and how they are cultured. The topics will cover the basic biology of these stem cells as well as bioengineering and application of these stem cells to potential treatments of human diseases.

Course Contents:

Module I

Definition, properties, proliferation, culture of stem cells, medical applications of stem cells, ethical and legal issues in use of stem cells.

Module II

Stem Cell biology and therapy, types embryonic stem cell, Adult stem cell, Stem Cell Biology and Therapy, Embryonic Stem Cells, culture and the potential benefits of stem cell technology

Module III

Gene Therapy: Introduction, History and evolution of Gene therapy, optimal disease targets, Failures and successes with gene therapy and future prospects, Genetic Perspectives for Gene Therapy, **Gene Delivery** methods: Viral vectors and Non-viral Vectors

Module IV

Regulatory and Ethical Considerations of stem cell and Gene Therapy, Assessing Human Stem Cell Safety, Use of Genetically Modified Stem Cells in Experimental Gene Therapies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Stem Cell Biology, Daniel Marshak, Richard L. Gardener and David Gottlieb, Cold Spring Harbour Laboratory Press
- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo*, Springer,

References:

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2, Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Understanding Biotechnology by Aluizio Borém, Fabrício R. Santos, David E. Bowen, Prentice Hall

TERM PAPER

Course Code: BTE2431

Credit Units: 02

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

- d) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- e) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- f) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- d) Get facts, not just opinions. Compare the facts with author's conclusion.
- e) In research studies, notice the methods and procedures, results & conclusions.
- f) Check cross references.

4. Outlining the paper

- c) Review notes to find main sub-divisions of the subject.
- d) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

- g) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section

may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.

- h) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- i) Check for proper spelling, phrasing and sentence construction.
- j) Check for proper form on footnotes, quotes, and punctuation.
- k) Check to see that quotations serve one of the following purposes:
 - (iv) Show evidence of what an author has said.
 - (v) Avoid misrepresentation through restatement.
 - (vi) Save unnecessary writing when ideas have been well expressed by the original author.
- l) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion&Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- e) summary of question posed
- f) summary of findings
- g) summary of main limitations of the study at hand
- h) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), Language and the internet. Cambridge: Cambridge University Press.

Edited Volumes

Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea. In: Gass, S./Neu, J. (eds.) (1996), Speech acts across cultures. Challenges to communication in a second language. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. Journal of consumer research 19, 180-197.

Electronic Book

Chandler, D. (1994), Semiotics for beginners [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

Electronic Journal Articles

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. German as a Foreign Language Journal [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

Other Websites

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

Unpublished Papers

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations

Möhl, S. (1996), Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

Appendix

The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation:

40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

Final Evaluation:

60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

PROJECT

Course Code: BTE2432

Credit Units: 02

Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) Body of the Report: The body of the report should have these four logical divisions

a) **Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b) **Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).

c) **Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).

d) **Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic

- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV : Writing the report dividing it into suitable chapters, viz.,

Chapter 1: Introduction,

Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

Step V : The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)

2) Student's declaration (Annexure-IB)

3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

WORKSHOP / CERTIFICATION

Course Code: BTE2433

Credit Units: 02

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

Accounting

Finance

Human Resources

Marketing

Economics

Operations

Supply Chain Management

These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:

Relevant study material and references will be provided by the trainer in advance.

The participants are expected to explore the topic in advance and take active part in the discussions held

Attending and Participating in all activities of the workshop

Group Activities have to be undertaken by students as guided by the trainer.

Evaluation of workshop activities would be done through test and quiz at the end of the workshop.

Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

Case Study

Business Game

Simulation

Group Activity

Role Play

Business Planning

Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

Syllabus – Fifth Semester

MOLECULAR BIOLOGY LAB

Course Code: BTE2505

Credit Units: 01

Course Contents:

Module I

Preparation of DNA: genomic, Plasmid

Module II

Isolation of RNA

Module III

RFLP analysis

Module IV

Gel filtration

Module V

Preparation of Competent Cells

Module VI

Restriction Digestion and Ligation of DNA

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

ANIMAL BIOTECHNOLOGY LAB

Course Code: BTE2506

CreditUnits: 02

Course Contents:

1. Preparation, standardization and sterilization of culture media
2. Inoculation of specific tissues for callusing
3. Inoculation and maintenance of cell lines
4. Study of toxicity on cell lines

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

PLANT BIOTECHNOLOGY LAB

Course Code: BTE2507

Credit Units: 02

Course Contents:

Module I

Sterilization of glasswares and equipments.
Preparation of cotton plugs and culture media
Preparation of stocks for culture media
Preparation of culture media

Module II

Preparation and sterilization of different explants
Inoculation of explants on culture media

Module III

Study of viability of seeds
Embryo culture

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

BIOINFORMATICS LAB

Course Code: BTE2508

Credit Units: 01

List of Experiments/Exercises

1. Basics of sequence analysis Retrieving a sequence-nucleic acid/Protein
2. Local and Global Alignment- concepts Pair wise sequence alignment
3. Multiple sequence alignment
4. DOT Matrix Analysis
5. Analysis Using Scoring Matrices
6. Dynamic Programming – Smith Watermann Algorithm Needleman Wunsch Algorithm
7. Protein identification, physical properties, motifs and patterns, structure, folding classes, structure classification
8. ESTs – databases, clustering, gene discovery and identification, and functional classification.
9. Molecular Structure drawing tool, Molecular modeling/Docking.

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

Note: Minor variation could be there depending on the examiner.

SUMMER INTERNSHIP EVALUATION-I

Course Code: BTE2535

Credit Units: 03

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

Methodology

The students will be sent to various industries and institutes where they will undergo short term training. After the completion of the training the students will be required to submit project report which shall then be evaluated by two internal examiners. The students will then have to appear for a Viva Voce examination to be conducted by an external evaluator at the end of the semester.

In general, the File should be comprehensive and include

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Report Layout

The report should contain the following components:

➤ **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

➤ **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

➤ **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

➤ **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

➤ **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

➤ **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

➤ **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in “point” form.

➤ **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

➤ **Future prospects**

➤ **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

➤ **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infec*, **8** (suppl 1): 116–117.

For book

Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following *assessment objectives*:

Range of Research Methods used to obtain information

Execution of Research

Data Analysis

Analyse Quantitative/ Qualitative information

Control Quality

Draw Conclusions

Examination Scheme:

Project Report	50
Viva Voce	50
Total	100

Course Objective:

The course is designed to give a broad view of mammalian stem cells, reviewing where they are found in the body, different types and how they are cultured. The topics will cover the basic biology of these stem cells as well as bioengineering and application of these stem cells to potential treatments of human diseases.

Course Contents:**Module I**

Stem Cell biology; types; embryonic stem cell, Adult stem cell and potential benefits of stem cell technology, Bone marrow transplants, Immunotherapy, Autoimmune Diseases and Promise of Stem Cell-Based Therapies, Stem Cells and Diabetes, Stem Cells and heart Repair

Module II

Gene Therapy: Introduction, History and evolution of Gene therapy, optimal disease targets, Failures and successes of gene therapy and future prospects; Gene Therapy and Immune System: Genetic Immunization, Innate and Acquired Immune Response to Gene Therapy

Module III

Gene Delivery methods; Viral vectors: Adenoviral, Adeno-associated virus (AAV), Retroviral, Lentiviral, Herpes Virus; Non-viral Vectors and Physical Methods & Combinatorial methods. Genetic perspectives for Gene Therapy, Gene Therapy for Cancer and Vascular Disorders, Nervous System.

Module IV

Regulatory and Ethical Considerations of Cell and Gene Therapy, Assessing Human Stem Cell Safety, Use of Genetically Modified Stem Cells in Experimental Gene Therapies.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:**Text:**

- Stem cell biology and gene therapy, Booth C., Cell Biology International, Academic Press
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, *Alexander Battler, Jonathan Leo*, Springer,

References:

- Stem Cell Biology and Gene Therapy. Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2, Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Understanding Biotechnology by Aluizio Borém, Fabrício R. Santos, David E. Bowen, Prentice Hall
- Cell Therapy: Stem Cell Transplantation, Gene Therapy, and Cellular Immunotherapy (Cancer: Clinical Science in Practice) George Morstyn, William Sheridan, Cambridge University Press,

Course Code: BTE2511

Credit Units: 02

Course Objective:

The objective is to introduce students to a modern programming language and help them gain sufficient fluency to undertake research projects with a programming component; to lay the foundations for more advanced study of object-oriented languages

Emphasis is on to understand the basic concepts of programming; to learn the syntax and semantics of Java; to be able to use a program development environment

Course Contents:

Module I

Introduction to Java - Features, Inheritance, Strings, Packages, Interfaces; Multi- Threading, Applet Programming: AWT- Components, Menus, Layout manager, etc., Event Handling,, Java Packages - java.util, -java.io; exception handling,

Module II

Collection API - Arrays, Collection Interfaces, Concrete Collections, The Collections Framework, Legacy Collections

Module III

Swing

Module IV

- JDBC
- Introduction to Client Server Application
- Java Drivers
- java.sql Package
- Installing and setting up JDBC
- Basic JDBC Programming concepts
- Populating a database
- Executing Queries
- Scrollable and Updateable Result Sets

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Complete reference by Herbert Schildt TataMcGraw Hill
- Programming with java A Primer by Balagurusamy Publisher: TataMcGraw Hill
- Core Java 2 – Volume I – Fundamentalsby Cay S. Horstmann and Gary Cornell published by Sun Microsystems Press, A Prentice Hall Title
- Thinking in Java– by Bruce Eckel published by Prentice Hall Computer Books

TERM PAPER

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

- g) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- h) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- i) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- g) Get facts, not just opinions. Compare the facts with author's conclusion.
- h) In research studies, notice the methods and procedures, results & conclusions.
- i) Check cross references.

4. Outlining the paper

- e) Review notes to find main sub-divisions of the subject.
- f) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

- m) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.

- n) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- o) Check for proper spelling, phrasing and sentence construction.
- p) Check for proper form on footnotes, quotes, and punctuation.
- q) Check to see that quotations serve one of the following purposes:
 - (vii) Show evidence of what an author has said.
 - (viii) Avoid misrepresentation through restatement.
 - (ix) Save unnecessary writing when ideas have been well expressed by the original author.
- r) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion&Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- i) summary of question posed
- j) summary of findings
- k) summary of main limitations of the study at hand
- l) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

Edited Volumes

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), *Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea*. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. *Journal of consumer research* 19, 180-197.

Electronic Book

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

Electronic Journal Articles

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal* [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

Other Websites

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

Unpublished Papers

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations

Möhl, S. (1996), *Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen*. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), *Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language*. Unpublished PhD dissertation, University College Dublin.

Appendix

The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation:

40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

Final Evaluation:

60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

PROJECT

Course Code: BTE2532

Credit Units: 02

Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) Body of the Report: The body of the report should have these four logical divisions

a) **Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b) **Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).

c) **Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).

d) **Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic

- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV : Writing the report dividing it into suitable chapters, viz.,

Chapter 1:Introduction,

Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

Step V : The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)

2) Student's declaration (Annexure-IB)

3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

Accounting

Finance

Human Resources

Marketing

Economics

Operations

Supply Chain Management

These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:

Relevant study material and references will be provided by the trainer in advance.

The participants are expected to explore the topic in advance and take active part in the discussions held

Attending and Participating in all activities of the workshop

Group Activities have to be undertaken by students as guided by the trainer.

Evaluation of workshop activities would be done through test and quiz at the end of the workshop.

Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

Case Study

Business Game

Simulation

Group Activity

Role Play

Business Planning

Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

RECOMBINANT DNA TECHNOLOGY

Course Code: BTE2601

Credit Units: 03

Course Objective:

A complete understanding of molecular techniques can be obtained through the course. The successful application of biotechnology largely depends on these advanced molecular techniques.

Course Contents:

Module I: Enzymes used in RDT

Restriction endonuclease, methyltransferase, ligase, polymerase, kinase, phosphatase, nuclease, transferase, reverse transcriptase.

Module II: Cloning vectors

Plasmids, bacteriophages (Lambda and M13), phagemids, cosmids, artificial chromosomes (YAC, BAC). expression vectors (Bacteria and yeast), vector engineering (fusion tags, antibiotic markers), codon optimization, host engineering

Module III: Blotting techniques and hybridization

Southern, Northern and Western blotting techniques. Radioactive and non-radioactive probes.

Module IV: Nucleic acid amplification and its applications

Principles of PCR, designing of primers

Module V: Cloning Techniques

Basic cloning experiment: Design of cloning strategy and stepwise experimental procedure, Complementation, colony and plaque hybridization, restriction, PCR, plus-minus screening, immunoscreening.

Module VI: DNA Libraries

Purpose of constructing DNA libraries. Construction of cDNA and genomic libraries.

Module VII: Sequencing of DNA

DNA sequencing (Maxam Gilbert, Sanger's and automated), protein engineering.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Principles of Gene Manipulation: An Introduction to Genetic Engineering, R.W. Old and S. B Primrose, Blackwell Science Inc.
- Recombinant DNA, J.D. Watson et al, W.H. Freeman and Company.

References:

- Molecular Biotechnology: Principles and Applications of Recombinant DNA, B.R. Grick and J.J. Pasternak, ASM Press.
- Molecular and Cellular Cells Methods in Biology and Medicine, P.B Kaufman, W. Wu, D. Kim and C.J. Cseke, CRC Press.
- Milestones in Biotechnology: Classic Papers on Genetic Engineering, J.A. Bavies and W.S. Reznikoff, Butterworth Heinemann.
- Gene Expression Technology, D.V. Goeddel in Methods in Methods in Enzymology, Academic Press Inc.
- DNA Cloning: A Practical Approach, D.M. Glover and B.D. Hames, IRL Press.
- Molecular Cloning: A Laboratory Manual, J. Sambrook, E.F. Fritsch and T. Maniatis, Cold Spring HarborLaboratory Press.

BIOPROCESS TECHNOLOGY

Course Code: BTE2602

Credit Units: 03

Course Objective:

The objective of the course is to apply the principles of biochemical engineering in large scale cultivation of microorganism for production of important products.

Course Contents:

Module I

Advantage of bioprocess over chemical process. Basic principle in bioprocess technology. Media formulation, Cell culture techniques; Inoculum development and aseptic transfers. Different types of pumps, valves, and line materials, piping conventions etc. used in Biochemical Process

Module II

Process technology for the production of primary metabolites, eg. biomass, ethanol, acetone-butanol, citric acid, amino acids, polysaccharides and plastics.

Ethanol: production by batch, continuous and cell recycle adopted by various technologies practiced in Indian distilleries using molasses and grains. Computation of fermentation efficiency, distillation efficiency and overall efficiency of ethanol production, recovery, uses, glucose effect etc. Power alcohol – definition, uses, merits and demerits of various technologies for its production.

Amino Acid: Genetic Control of metabolic pathway.

Lysine: Indirect and direct fermentation – mechanism of ph of metabolic block in accumulation of L-lysine by inhibition and repression mechanism.

Biomass: Bakers and distillers yeast production using various raw materials, “bios” factors for growth, Crabtree effect, harvesting, different forms and uses.

What are mushroom, different forms of common mushroom production from agro based raw materials and uses. Biofertilizers, biocompost and biopesticides

Module III

Production of secondary metabolites – penicillin, cephalosporins, streptomycin, tetracycline etc. Metabolites from plant and animal cell culture

Penicillin: Classification, various penicillin as precursor and ‘R’ – side chain, penicillinase, 6-APA, penicillin production, harvest and recovery, uses of various forms etc.

Streptomycin: chemical structure, production, harvest and recovery, use by-product of streptomycin fermentation etc.

Tetracycline: chemical structure, production, harvest and recovery, use by-product of tetracycline fermentation etc.

Module IV

Microbial production of industrial enzymes – glucose isomerase, penicillin acylase, cellulase, amylase, lipase, protease etc.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Biochemical Engineering- Kinetics, Mass Transport, Reactors and Gene Expression, W F Weith, John Wiley and Sons Inc
- Biochemical Engineering, S Aiba, A E Humphery and N F Millis, University of Tokyo Press
- Bioprocess Engineering Basic Concepts, M.L. Shuler and F. Kargi, Prentice Hall
- Bioprocess Engineering, B.K. Lydersen, K.L. Nelson, B.K. Lyderson and N. D'Elia, John Wiley and Sons Inc.
- Bioprocess Engineering Principles, P Doran, Academic Press
- Biotechnology. A Textbook of Industrial Microbiology, W. Crueger and a. Crueger, Sinauer Associates.
- Principles of Fermentation Technology, P.F. Stanbury and A. Whitaker, Pergamon Press
- Process Engineering in Biotechnolgy, A T Jackson, Prentice Hall

IMMUNOLOGY AND IMMUNOTECHNOLOGY

Course Code: BTE2603

Credit Units: 03

Course Objective:

Role of antibody engineering in biomedical applications and the importance of immuno genetics in disease processes, tissue transplantation and immune regulation are some of the areas of attributes of this course which can help the students to understand the biotechnology related to human kind.

Course Contents:

Module I: Introduction

Phylogeny of Immune System, Innate and acquired immunity, clonal nature of Immune Response. Organization and structure of lymphoid organs Nature and Biology of antigens and super antigens Antibody structure and function; Types of immunity- innate, acquired, active and passive.

Module II: Major Histocompatibility

MHC, BCR and TCR, generation of antibody diversity, Complement system

Module III: Cells of the immune system

Hematopoiesis and differentiation, lymphocyte trafficking, B-Lymphocytes, T -Lymphocytes, macrophages, dendritic cells, natural killer, lymphokines and lymphokine activated killer cells, eosinophils, neutrophils and mast cells

Module IV: Regulation of immune response

Antigen processing and presentation, activation of B and T lymphocytes, cytokines and their role in immune regulation, T cell regulation and MHC restriction, immunological tolerance

Module V: Cell mediated toxicity

Mechanism of T cell and NK cell mediated lysis and macrophage mediated cytotoxicity.

Module VI: Hypersensitivity

Module VII: Autoimmunity

Module VIII: Tumor immunology, Immunity to infectious agents

Module IX: Transplantation Immunology

Module X: Synthetic vaccines

Vaccines: General consideration, idotype network hypothesis, Synthetic vaccines

Module XI: Hnmunological Techniques

Immuno diffusion, immuno-electrophoresis, ELISA, RIA, fluorescence activated cell sorter

Module XII: Hybridoma technology and its applications

Fusion of myeloma cells with lymphocytes

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company
- Basic Immunology, A.K. Abbas and A.H. Lichtman, Saunders W.B. Company

References:

- Fundamentals of Immunology, W. Paul, Lippincott Williams and Wilkins
- Immunology, W.L. Anderson, Fence Creek Publishing (Blackwell).
- Immunology: A Short Course, E. Benjamin, R. Coico and G. Sunshine, Wiley-Leiss Inc.
- Immunology, Roitt, Mosby – Yearbook Inc.
- Kuby Immunology, R.A. Goldsby, T.J. Kindt, and B.A. Osborne, Free

RECOMBINANT DNA TECHNOLOGY LAB

Course Code: BTE2605

Credit Units: 02

Course Objective:

The laboratory experiments in Recombinant DNA Technology would certainly help to comprehend the theoretical aspects of the subject.

Course Contents:

Module I

Study of cloning (GFP CLONING)

Module II

Study of PCR

Module III

Study of Southern hybridisation

Module IV

Study of RAPD

Module V

Site directed mutagenesis

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

BIOPROCESS TECHNOLOGY LAB

Course Code: BTE2606

Credit Units: 02

Course Contents:

Module I

Isolation of industrially important micro organisms for microbial processes.

Module II

Determination of Thermal Death Point and Thermal death time of micro organisms for design of a sterilizer

Module III

Determination of growth curve of a supplied micro organism and also determine substrate degradation profile and to compute specific growth rate and growth yield from the data obtained.

Module IV

Comparative studies of ethanol production using different substrates.

Module V

Production of single cell protein

Module VI

Production and estimation of alkaline protease

Module VII

Sauer Krant fermentation

Module VIII

Use of alginate for cell immobilization

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

IMMUNOLOGY AND IMMUNOTECHNOLOGY LAB

Course Code: BTE2607

Credit Units: 01

Course Contents:

Module I

Blood film preparation and identification of cells.

Module II

Identification of blood group.

Module III

Isolation of serum.

Module IV

Lymphoid organs and their microscopic organization.

Module V

WIDAL Test

Module VI

Radial Immuno Diffusion Test

Module VII

Ouchterlony Double diffusion Test

Module VIII: Elisa

DOT, SANDWICH

Module IX

Purification of IgG through affinity chromatography

Module X

Immunohistochemistry

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

PHARMACEUTICAL BIOTECHNOLOGY

Course Code: BTE2608

Credit Units: 02

Course Objective:

The main objectives are to cover representative pharmaceutical dosage forms, and general issues of formulation, production, quality requirements, validation and uses and to gain an understanding of the challenges associated with quality pharmaceutical manufacturing

Course Contents:

Module I

Introduction to Physical Pharmaceutics - Metrology and Calculations,

Module II

Molecular structure, properties and States of Matter, Solutions, Phase Equilibria, Micromeritic and Powder Rheology, Surface and Interfacial Phenomena, Dispersion Systems, Diffusion & Dissolution, Kinetics and drug stability, Viscosity & Rheology

Module III

Polymer Science and Applications, Formulations and Development, Packaging

Module IV

Introduction to Industrial Processing, Transport Phenomena (Fluid Flow, Heat Transfer and Mass Transfer)

Module V

Particulate Technology (Particle Size, Size reduction, Size Separation, Powder Flow and Compaction), Unit Operations (Mixing, Evaporation, Filtration, Centrifugation, Extraction, Distillation, and Drying)

Module VI

Materials of Pharmaceutical Plant Construction, Good Manufacturing Practice (GMP's) Guidelines

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Bentley's Pharmaceutics by E A Rawlins
- Pharmaceutical Sciences by Remington

References:

- Physical Pharmacy by Alfred Martin.
- Cooper and Gunn's Tutorial Pharmacy

MOLECULAR MODELLING

Course Code: BTE2609

Credit Units: 02

Course Objective:

The students should be able to understand and work on the following topics: various levels of structural organizations in bio-molecules; representation of the 2D and 3D structures: coordinate systems & modeling; bioinformatics approaches for structure analysis and structure predictions; conformations & analysis of macromolecules.

Course Contents

Module I

Internal and external co-ordinate system; Generation of co-ordinates of biopolymers in Cartesian and cylindrical polar co-ordinate System.

Module II: Anatomy of Biomolecules

Proteins: Ramachandran plot; Secondary structures; Motifs; Domains; Tertiary and quaternary structures; Fold recognition; Methods for Comparison of 3D structures; DNA: A, B, Z DNA, DNA bending etc.; RNA structure; Structure of Ribosome

Module III: Analysis of Structural data banks

Protein Data Bank, Cambridge small molecular crystal structure data bank; Calculation of conformational energy for bio-macromolecules; Developing the energy functions & Force fields; Charge calculation methods

Module IV: Molecular optimization techniques

Newton Raphson, Conjugate Gradient, Genetic algorithms, simulated annealing applied to Biomolecules.

Module V

Methods to predict three dimensional structures of nucleic acids, rRNA, tRNA, and proteins

Module VI

Molecular mechanics & dynamics of oligopeptides, proteins, nucleotides and small molecules; Conformational Searches; Simulation of molecular mechanics and dynamics; Simulations of Free Energy changes; Electrostatics of Biomolecules

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Conformations of Biopolymers, Vol. 2. Edited by G.N.Ramachandran.
- Ramachandran, G.N. and Sasisekharan, V. (1968) Conformation of polypeptides and proteins. Adv. Prot. Chem., 23, 283.
- Creighton, T. E. (Ed.); Protein Structure: A Practical Approach (1989).
- Creighton, T.E.: Proteins: Structure And Molecular Properties. 2nd Edition. New York. W. H. Freeman and Company, (1993).
- Creighton: Protein Folding, (1992).
- JA McCammon & S.Hervey: Molecular Dynamics of Protein & Nucleic acids, (1989).
- Sternberg, M.J.E.: Protein structure prediction: a practical approach, (1996)
- Pain, R.G.: Mechanisms of protein folding, (1994)
- Leach.A.R: Molecular modelling: principles and applications

ARTIFICIAL NEURAL NETWORKS

Course Code: BTE2610

Credit Units: 02

Course Objective:

This course will enable the students to gain knowledge about a relatively newer area of science. The course is designed to model the different technical properties, applications, besides the closely related aspects of artificial neural networks.

Course Contents:

Module I

Historical background, Why is learning hard?

Module II

Memorization, generalization and function approximation, Linear Associators, Perceptrons and Capacity, Multilayer neural networks, Maximum Likelihood and Gradient Descent learning, Stochastic gradient descent for supervised learning.

Module III

The back propagation algorithm, Aspects of Learning Theory and Generalization, Bias vs. variance, Overtraining, pruning and regularization, VC dimension and how much data is enough?.

Module IV

Neural networks and analog VLSI, Selected Applications.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Neural Networks: A Comprehensive Foundation by S. Haykin, Prentice Hall.

References:

- Neural Networks for Pattern Recognition by C. Bishop, Oxford University Press.

JAVA-II

Course Code: BTE2611

Credit Units: 02

Course Objective

The objective is to introduce students to a serverside programming language and help them gain sufficient fluency to undertake research projects with a programming component; to lay the foundations for study of web technologies and different tools used for the same.

Emphasis is on to understand the basic concepts of web programming; to learn the syntax and semantics of Servlet and JSP; to be able to use a server side program development environment

Course Contents

Module I

HTML and JavaScript, Creating and processing HTML forms

Module II

Java Servlets

Introduction to Server Side Application Development

Basics of Servlet Programming

Web Container

Session Tracking

Servlet Context

Module III: JSP

Advantage of JSP technology (Comparision with ASP / Servlet)

JSP Architecture, JSP Access Model

JSP Syntax Basic (Directions, Declarations, Expression, Scriplets, Comments)

JSP Implicit Object, Object Scope

Synchronization Issue

Exception Handling

Session Management

Module IV: Java Network Programming

Connecting to a server

Implementing Servers in Java

URL Connections

Reading and Posting data

Security and the Network

Java Beans

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

- Complete reference by Herbert Schildt TataMcGraw Hill
- Professional Java XML Programming with Servlets and JSPby Alexander Nakhimovsky and Tom Myers published by Wrox Press Ltd.
- More Servlets and Java Server Pagesby Marty Hall published by Sun Microsystems Press, A Prentice Hall Title.
- Special Edition – Using Java Server Pages and Servlets by Mark Wutkapublished by Que

TERM PAPER

Course Code: BTE2631

Credit Units: 02

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

- j) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- k) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- l) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- j) Get facts, not just opinions. Compare the facts with author's conclusion.
- k) In research studies, notice the methods and procedures, results & conclusions.
- l) Check cross references.

4. Outlining the paper

- g) Review notes to find main sub-divisions of the subject.
- h) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

- s) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section

may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.

- t) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- u) Check for proper spelling, phrasing and sentence construction.
- v) Check for proper form on footnotes, quotes, and punctuation.
- w) Check to see that quotations serve one of the following purposes:
 - (x) Show evidence of what an author has said.
 - (xi) Avoid misrepresentation through restatement.
 - (xii) Save unnecessary writing when ideas have been well expressed by the original author.
- x) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion&Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- m) summary of question posed
- n) summary of findings
- o) summary of main limitations of the study at hand
- p) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

Edited Volumes

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), *Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea*. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles

McQuarrie, E.F./Mick, D.G. (1992), On resonance: A critical pluralistic inquiry into advertising rhetoric. *Journal of consumer research* 19, 180-197.

Electronic Book

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

Electronic Journal Articles

Watts, S. (2000) Teaching talk: Should students learn 'real German'? [HTML document]. *German as a Foreign Language Journal* [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

Other Websites

Verterhus, S.A. (n.y.), Anglicisms in German car advertising. The problem of gender assignment [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

Unpublished Papers

Takahashi, S./DuFon, M.A. (1989), Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations

Möhl, S. (1996), *Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen*. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), *Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language*. Unpublished PhD dissertation, University College Dublin.

Appendix

The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation:

40%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

Final Evaluation:

60%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

PROJECT

Course Code: BTE2632

Credit Units: 02

Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) Body of the Report: The body of the report should have these four logical divisions

a) **Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b) **Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).

c) **Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).

d) **Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic

- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV : Writing the report dividing it into suitable chapters, viz.,

Chapter 1:Introduction,

Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

Step V : The following documents are to be attached with the Final Project Report.

1) Approval letter from the supervisor (Annexure-IA)

2) Student's declaration (Annexure-IB)

3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

WORKSHOP / CERTIFICATION

Course Code: BTE2633

Credit Units: 02

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

Accounting

Finance

Human Resources

Marketing

Economics

Operations

Supply Chain Management

These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:

Relevant study material and references will be provided by the trainer in advance.

The participants are expected to explore the topic in advance and take active part in the discussions held

Attending and Participating in all activities of the workshop

Group Activities have to be undertaken by students as guided by the trainer.

Evaluation of workshop activities would be done through test and quiz at the end of the workshop.

Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

Case Study

Business Game

Simulation

Group Activity

Role Play

Business Planning

Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

Syllabus – Seventh Semester

IPR, BIOSAFETY & BIOETHICS

Course Code: BTE2702

Credit Units: 02

Course Objective

The aim of this course is to develop the understanding of relevance, business Impact and protection of Intellectual Property along with the types of Intellectual Property Rights: Patents, Trademarks, Copyrights, Industrial Designs, Geographical Indications and International Conventions, Biosafety and Bioethics

Course Contents

Module I: Basic Principles and Acquisition of Intellectual Property Rights

Basic Principles of Patent Law, Patent Application procedure, Drafting of a Patent Specification, Understanding Copyright Law, Basic Principles of Trade Mark and Design Rights, International Background of Intellectual Property

Module II: Ownership and Enforcement of Intellectual Property Rights

Patents-Objectives, Rights, Assignments, Defences in case of Infringement. Copyright-Objectives, Rights, Transfer of Copyright, work of employment Infringement, Defences for infringement. Trademarks-Objectives, Rights, Protection of goodwill, Infringement, Passing off, Defences. Designs-Objectives, Rights, Assignments, Infringements, Defences of Design Infringement, Enforcement of Intellectual Property Rights - Civil Remedies, Criminal Remedies, Border Security measures, Practical Aspects of Licensing - Benefits, Determinative factors, important clauses, licensing clauses.

Module III: Information Technology Related Intellectual Property Rights

Computer Software and Intellectual Property-Objective, Copyright Protection, Reproducing, Defences, Patent Protection, Database and Data Protection-Objective, Need for Protection, UK Data Protection Act, 1998, US Safe Harbor Principle, Enforcement. Protection of Semi-conductor Chips-Objectives Justification of protection, Criteria, Subject-matter of Protection, WIPO Treaty, Trips, SCPA. Domain Name Protection-Objectives, domain name and Intellectual Property, Registration of domain names, disputes under Intellectual Property Rights, Jurisdictional Issues, International Perspective.

Module IV: Biotechnology and Intellectual Property Rights

Biotechnology and the Law- Objective, Evolution, Basic Structure of Gene Techniques, Applications, Commercial Potential of Biotech Inventions, Rationale for Intellectual Property Protection. Patenting Biotechnology Inventions-Objective, Concept of Novelty, Concept of inventive step, Microorganisms, Moral Issues in Patenting Biotechnological inventions. Plant Varieties Protection-Objectives, Justification, International Position, Plant Varieties Protection in India Protection of Geographical Indications Objectives, Justification, International Position, Multilateral Treaties, National Level, Indian Position.

Module V

Protection of Traditional Knowledge- Objective, Concept of Traditional Knowledge, Holders, Issues concerning, Bio-Prospecting and Bio-Piracy, Alternative ways, Protectability, need for a Sui-Generis regime, Traditional Knowledge on the International Arena, at WTO, at National level, Traditional Knowledge Digital Library.

Module VI

Biosafety and Bioethics Management-Key to environmentally responsible use of biotechnology. Cartagena Protocol on Biosafety, Ethical implications of Biotechnological products and techniques.

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:***Text***

- Intellectual Property Rights by Birgitte Anderson, Edward Elgar Publishing
- Intellectual Property Rights and the Life Science Industries by Graham Dutfield, Ashgate Publishing

References

- WIPO Intellectual Property Handbook
- Intellectual Property by William Rodelph Cornish, David Clewelyn
- Globalising Intellectual Property Rights by Duncan Matthews
- Journals and Current magazines

RESEARCH METHODOLOGY AND REPORT WRITING

Course Code: BTE2703

Credit Units: 02

Course Objective

To develop understanding of information and library science research issues in the domain of bioinformatics through review of journal articles, invited talks, and critical group discussions of methods. The main objectives for this course are to develop: familiarity with information and library science-oriented problems in the biomedical sciences, an understanding of research methods in the biomedical domain, critical thinking and evaluation skills and presentation and summarization skills.

Course Contents

Module I

Introduction: Science, Scientific Field and Biological research. Role of a researcher in different stages of a project, Routes to research funding (academic and commercial)

Module II

Research – Definition – Importance and Meaning of research – Characteristics of research – Types of Research – Steps in research – Identification, Selection and formulation of research problem – Research questions – Research design – Formulation of Hypothesis – Review of Literature.

Module III: Sampling techniques

Sampling theory – types of sampling – Steps in sampling – Sampling and Non-sampling error – Sample size – Advantages and limitations of sampling. Collection of Data: Primary Data – Meaning – Data Collection methods – Secondary data – Meaning - Relevance's, Limitations and cautions. Statistics in Research.

Module IV

Type of Articles (review, letters etc). Scientific paper format (Abstract, Introduction, Materials and Methods, Results, Discussion). Writing, evaluating, presenting and publishing the results of scientific research in the academic press (journals, conferences etc). Choosing the appropriate journal (Sources, Information, Instructions to authors, peer review system, journal evaluation)

Module V

Case studies of areas of current research. Formulating a research plan and its presentation

Examination Scheme:

Components	CT	Attendance	Assignment/ Project/Seminar/Quiz	EE
Weightage (%)	15	5	10	70

Text & References:

Text:

- Statistical Methods By S.P. Gupta

References:

- Research Methodology Methods and Techniques by C.R. Kothari
- Statistics(Theory and Practice) by B.N. Gupta
- Research Methodology Methods and statistical Techniques by Santosh Gupta
- Scientific journals and magazines

GENOMICS AND PROTEOMICS LAB

Course Code: BTE2704

Credit Units: 02

Course Contents:

Module I

Three dimensional Structures – In silico study – large molecular complexes RNA polymerase II, ribosome, unstructured proteins

Module II

DNA sequencing methods

Module III

Gene finding tools and Genome annotation

Module IV

Comparison of two given genomes

Module V

Analysis of 2D – IEF data

Module VI

Microarray and Microarray data analysis

Module VII

Inference of protein function from structure

Module VIII

Inference of protein function and structure

Module IX

Two-hybrid methods

Examination Scheme:

IA			EE			
Class Test (Practical Based)	Mid Term Viva	Attendance	Major Experiment	Minor Experiment/Spotting	Practical Record	Viva
15	10	05	35	15	10	10

SUMMER INTERNSHIP EVALUATION-II

Course Code: BTE2735

Credit Units: 03

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

Methodology

The students will be sent to various industries and institutes where they will undergo short term training. After the completion of the training the students will be required to submit project report which shall then be evaluated by two internal examiners. The students will then have to appear for a Viva Voce examination to be conducted by an external evaluator at the end of the semester.

In general, the File should be comprehensive and include

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Report Layout

The report should contain the following components:

➤ Title or Cover Page

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

➤ Acknowledgements (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

➤ Abstract

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

➤ Table of Contents

Titles and subtitles are to correspond exactly with those in the text.

➤ **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

➤ **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

➤ **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in “point” form.

➤ **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

➤ **Future prospects**

➤ **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

➤ **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infec*, **8** (suppl 1): 116–117.

For book

Kowalski, M. (1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), **7**: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following *assessment objectives*:

Range of Research Methods used to obtain information

Execution of Research

Data Analysis

Analyse Quantitative/ Qualitative information

Control Quality

Draw Conclusions

Examination Scheme:

Project Report	50
Viva Voce	50
Total	100

TERM PAPER

METHODOLOGY

A term (or research) paper is primarily a record of intelligent reading in several sources on a particular subject.

The students will choose the topic at the beginning of the session in consultation with the faculty assigned. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned. The evaluation will be done by Board of examiners comprising of the faculties.

GUIDELINES FOR TERM PAPER

The procedure for writing a term paper may consists of the following steps:

- Choosing a subject
- Finding sources of materials
- Collecting the notes
- Outlining the paper
- Writing the first draft
- Editing & preparing the final paper

1. Choosing a Subject

The subject chosen should not be too general.

2. Finding Sources of materials

- m) The material sources should be not more than 10 years old unless the nature of the paper is such that it involves examining older writings from a historical point of view.
- n) Begin by making a list of subject-headings under which you might expect the subject to be listed.
- o) The sources could be books and magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes

Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.

- m) Get facts, not just opinions. Compare the facts with author's conclusion.
- n) In research studies, notice the methods and procedures, results & conclusions.
- o) Check cross references.

4. Outlining the paper

- i) Review notes to find main sub-divisions of the subject.
- j) Sort the collected material again under each main division to find sub-sections for outline so that it begins to look more coherent and takes on a definite structure. If it does not, try going back and sorting again for main divisions, to see if another general pattern is possible.

5. Writing the first draft

Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:

- a) statement of purpose
- b) main body of the paper
- c) statement of summary and conclusion

Avoid short, bumpy sentences and long straggling sentences with more than one main ideas.

6. Editing & Preparing the final Paper

- y) Before writing a term paper, you should ensure you have a question which you attempt to answer in your paper. This question should be kept in mind throughout the paper. Include only information/ details/ analyses of relevance to the question at hand. Sometimes, the relevance of a particular section may be clear to you but not to your readers. To avoid this, ensure you briefly explain the relevance of every section.
- z) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
- aa) Check for proper spelling, phrasing and sentence construction.
- bb) Check for proper form on footnotes, quotes, and punctuation.
- cc) Check to see that quotations serve one of the following purposes:
 - (xiii) Show evidence of what an author has said.
 - (xiv) Avoid misrepresentation through restatement.
 - (xv) Save unnecessary writing when ideas have been well expressed by the original author.
- dd) Check for proper form on tables and graphs. Be certain that any table or graph is self-explanatory.

Term papers should be composed of the following sections:

- Title page
- Table of contents
- Introduction
- Review
- Discussion&Conclusion
- References
- Appendix

Generally, the introduction, discussion, conclusion and bibliography part should account for a third of the paper and the review part should be two thirds of the paper.

Discussion

The discussion section either follows the results or may alternatively be integrated in the results section. The section should consist of a discussion of the results of the study focusing on the question posed in the research paper.

Conclusion

The conclusion is often thought of as the easiest part of the paper but should by no means be disregarded. There are a number of key components which should not be omitted. These include:

- q) summary of question posed
- r) summary of findings
- s) summary of main limitations of the study at hand
- t) details of possibilities for related future research

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.

The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

The key to a good bibliography is consistency. Choose a particular convention and stick to this.

Bibliographical conventions

Monographs

Crystal, D. (2001), *Language and the internet*. Cambridge: Cambridge University Press.

Edited Volumes

Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter.

[(eds.) is used when there is more than one editor; and (ed.) where there is only one editor. In German the abbreviation used is (Hrsg.) for Herausgeber].

Edited Articles

Schmidt, R./Shimura, A./Wang, Z./Jeong, H. (1996), *Suggestions to buy: Television commercials from the U.S., Japan, China, and Korea*. In: Gass, S./Neu, J. (eds.) (1996), *Speech acts across cultures. Challenges to communication in a second language*. Berlin/ NY: Mouton de Gruyter: 285-316.

Journal Articles

McQuarrie, E.F./Mick, D.G. (1992), *On resonance: A critical pluralistic inquiry into advertising rhetoric*. *Journal of consumer research* 19, 180-197.

Electronic Book

Chandler, D. (1994), *Semiotics for beginners* [HTML document]. Retrieved [5.10.'01] from the World Wide Web, <http://www.aber.ac.uk/media/Documents/S4B/>.

Electronic Journal Articles

Watts, S. (2000) *Teaching talk: Should students learn 'real German'?* [HTML document]. *German as a Foreign Language Journal* [online] 1. Retrieved [12.09.'00] from the World Wide Web, <http://www.gfl-journal.com/>.

Other Websites

Verterhus, S.A. (n.y.), *Anglicisms in German car advertising. The problem of gender assignment* [HTML document]. Retrieved [13.10.'01] from the World Wide Web, <http://olaf.hiof.no/~sverrev/eng.html>.

Unpublished Papers

Takahashi, S./DuFon, M.A. (1989), *Cross-linguistic influence in indirectness: The case of English directives performed by native Japanese speakers*. Unpublished paper, Department of English as a Second Language, University of Hawai'i at Manoa, Honolulu.

Unpublished Theses/ Dissertations

Möhl, S. (1996), *Alltagssituationen im interkulturellen Vergleich: Realisierung von Kritik und Ablehnung im Deutschen und Englischen*. Unpublished MA thesis, University of Hamburg.

Walsh, R. (1995), *Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language*. Unpublished PhD dissertation, University College Dublin.

Appendix

The appendix should be used for data collected (e.g. questionnaires, transcripts,...) and for tables and graphs not included in the main text due to their subsidiary nature or to space constraints in the main text.

Assessment Scheme:

Continuous Evaluation:

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

40%

Final Evaluation:

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

60%

PROJECT

Course Code: BTE2732

Credit Units: 02

Objectives:

The aim of the project is to provide the students with an opportunity to further their intellectual and personal development in the chosen field by undertaking a significant practical unit of activity. The project can be defined as a scholarly inquiry into a problem or issues, involving a systematic approach to gathering and analysis of information / data, leading to production of a structured report.

Chapter Scheme and distribution of marks:

Chapter 1: Introduction – 10 marks

Chapter 2: Conceptual Framework/ National/International Scenario – 25 marks

Chapter 3: Presentation, Analysis & Findings -- 25 marks

Chapter 4: Conclusion & Recommendations -- 10 marks

Chapter 5: Bibliography -- 05 marks

Project Report	Power Point Presentation & Viva
75 marks	25 marks

Components of a Project Report

The outcome of Project Work is the Project Report. A project report should have the following components:

1) Cover Page: This should contain the title of the project proposal, to whom it is submitted, for which degree, the name of the author, name of the supervisor, year of submission of the project work, name of the University.

2) Acknowledgement: Various organizations and individuals who might have provided assistance /co-operation during the process of carrying out the study.

3) Table of Content: Page-wise listing of the main contents in the report, i.e., different Chapters and its main Sections along with their page numbers.

4) Body of the Report: The body of the report should have these four logical divisions

a) **Introduction:** This will cover the background, rationale/ need / justification, brief review of literature, objectives, methodology (the area of the study, sample, type of study, tools for data collection, and method of analysis), Limitations of the Study, and Chapter Planning.

b) **Conceptual Framework / National and International Scenario:** (relating to the topic of the Project).

c) **Presentation of Data, Analysis and Findings:** (using the tools and techniques mentioned in the methodology).

d) **Conclusion and Recommendations:** In this section, the concluding observations based on the main findings and suggestions are to be provided.

5) Bibliography or References: This section will include the list of books and articles which have been used in the project work, and in writing a project report.

6) Annexures: Questionnaires (if any), relevant reports, etc.

(The main text of the Project should normally be in the range of 5000 words. However, there may be annexure in addition to the main text)

The Steps of a Project Report

Step I : Selection of the topic for the project by taking following points into consideration:

- Suitability of the topic.
- Relevance of the topic
- Time available at the disposal.
- Feasibility of data collection within the given time limit.
- Challenges involved in the data collection (time & cost involved in the data collection, possibility of getting responses, etc.)

Step II : Finalisation of the Topic and preparation of Project Proposal in consultation with the Supervisor.

Step III : Collection of information and data relating to the topic and analysis of the same.

Step IV: Writing the report dividing it into suitable chapters, viz.,

Chapter 1: Introduction,

Chapter 2: Conceptual Framework / National & International Scenario,

Chapter 3: Analysis & Findings

Chapter 4: Conclusion and Recommendations.

Step V: The following documents are to be attached with the Final Project Report.

- 1) Approval letter from the supervisor (Annexure-IA)
- 2) Student's declaration (Annexure-IB)
- 3) Certificate from the Competent Authority of the Organisation / Institution, if the student undertakes the Project Work in any Organisation / Institution.

Guidelines for Evaluation:

- Each of the students has to undertake a Project individually under the supervision of a teacher and to submit the same following the guidelines stated below.
- Language of Project Report and Viva-Voce Examination may be English. The Project Report must be typed and hard bound.
- Failure to submit the Project Report or failure to appear at the Viva-voce Examination will be treated as "Absent" in the Examination. He /she has to submit the Project Report and appear at the Viva-Voce Examination in the subsequent years (within the time period as per University Rules).
- No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.
- Evaluation of the Project Work to be done jointly by one internal expert and one external expert with equal weightage, i.e., average marks of the internal and external experts will be allotted to the candidate.

WORKSHOP / CERTIFICATION

Course Code: BTE2733

Credit Units: 02

Objectives

A workshop is primarily an activity based academic event that is organized to provide the students a one to one and hands on experience on any aspect of their learning. The communication in a workshop has to be necessarily two way. The trainer has to make sure that the aspect covered are practically practiced by the participants. The student will choose the option of workshop from amongst their concentration electives. The evaluation will be done by Board of examiners comprising of the faculties.

Major Themes for Workshop

The workshop may be conducted on any of the following major themes:

Accounting

Finance

Human Resources

Marketing

Economics

Operations

Supply Chain Management

These themes are merely indicative and other recent and relevant topics of study may be included.

Guidelines for Workshop

The procedure for earning credits from workshop consists of the following steps:

Relevant study material and references will be provided by the trainer in advance.

The participants are expected to explore the topic in advance and take active part in the discussions held

Attending and Participating in all activities of the workshop

Group Activities have to be undertaken by students as guided by the trainer.

Evaluation of workshop activities would be done through test and quiz at the end of the workshop.

Submitting a write up of at least 500 words about the learning outcome from the workshop.

Methodology

The methodology followed at the workshop could be based on any one or more of the following methods:

Case Study

Business Game

Simulation

Group Activity

Role Play

Business Planning

Quiz

Evaluation Scheme:

Attendance	Active Participation	Multiple Choice Questions/ Quiz	Solving the case/ Assignment/ Write up	Total
10	30	30	30	100

Syllabus – Eighth Semester

PROJECT/ DISSERTATION

Course Code: BTE2837

Credit Units: 17

Course Objective:

The students are expected to utilize their scheduled periods by undertaking the project that would be completed during the semester

Every student shall undertake a major Project. The major Project shall be undertaken in some biotechnology industry or laboratory of repute. Each student shall be assigned to a faculty who shall continuously monitor the progress of the Project in the concerned laboratory or industry. The faculty, in consultation with the concerned scientist of the industry/laboratory, shall decide the topic of the project. At the conclusion of the project the student shall submit a seminar and a dissertation. The dissertation shall be evaluated by the internal faculty/examiner. The student then shall have to appear for the viva voce examination.

GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation.

Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage.

The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

- A short account of the activities that were undertaken as part of the project;
- A statement about the extent to which the project has achieved its stated goals.
- A statement about the outcomes of the evaluation and dissemination processes engaged in as part of the project;
- Any activities planned but not yet completed as part of the project, or as a future initiative directly resulting from the project;
- Any problems that have arisen that may be useful to document for future reference.

Report Layout

The report should contain the following components:

➤ **Title or Cover Page**

The title page should contain the following information: Project Title; Student's Name; Course; Year; Supervisor's Name.

➤ **Acknowledgements** (optional)

Acknowledgment to any advisory or financial assistance received in the course of work may be given.

➤ **Abstract**

A good "Abstract" should be straight to the point; not too descriptive but fully informative. First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project

➤ **Table of Contents**

Titles and subtitles are to correspond exactly with those in the text.

➤ **Introduction**

Here a brief introduction to the problem that is central to the project and an outline of the structure of the rest of the report should be provided. The introduction should aim to catch the imagination of the reader, so excessive details should be avoided.

➤ **Materials and Methods**

This section should aim at experimental designs, materials used. Methodology should be mentioned in details including modifications if any.

➤ **Results and Discussion**

Present results, discuss and compare these with those from other workers, etc. In writing these section, emphasis should be given on what has been performed and achieved in the course of the work, rather than discuss in detail what is readily available in text books. Avoid abrupt changes in contents from section to section and maintain a lucid flow throughout the thesis. An opening and closing paragraph in every chapter could be included to aid in smooth flow.

➤ Note that in writing the various sections, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary never write in "point" form.

➤ **Conclusion**

A conclusion should be the final section in which the outcome of the work is mentioned briefly.

➤ **Future prospects**

➤ **Appendices**

The Appendix contains material which is of interest to the reader but not an integral part of the thesis and any problem that have arisen that may be useful to document for future reference.

➤ **References / Bibliography**

This should include papers and books referred to in the body of the report. These should be ordered alphabetically on the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples

For research article

Voravuthikunchai SP, Lortheeranuwat A, Ninrprom T, Popaya W, Pongpaichit S, Supawita T. (2002) Antibacterial activity of Thai medicinal plants against enterohaemorrhagic *Escherichia coli* O157: H7. *Clin Microbiol Infect*, 8(suppl 1): 116–117.

For book

Kowalski, M.(1976) Transduction of effectiveness in *Rhizobium meliloti*. SYMBIOTIC NITROGEN FIXATION PLANTS (editor P.S. Nutman IBP), 7: 63-67

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.

Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.

Project execution is concerned with assessing how much work has been put in.

The File should fulfill the following *assessment objectives*:

Range of Research Methods used to obtain information

Execution of Research

Data Analysis

Analyse Quantitative/ Qualitative information

Control Quality

Draw Conclusions

Examination Scheme:

Dissertation: 100

Viva Voce: 100

Total: 200