Bachelor of Science (Honors) Biotechnology

Syllabus - First Semester

COMPUTER APPLICATIONS

Course Code: BTH2103   **Credit Units: 03**

Course Objective:
To provide computer skills and knowledge for commerce students, and to make them complacent with the use of new tools of IT

Course Contents:
Module I
General features of a Computer. Generation of computers.Personal Computer, Workstation, Mainframe Computer and super Computers.Computer applications – data processing, information processing, Application areas of computer.
Module II
Computer organization.Central processing module.Computer memory- primary memory and secondary memory.Secondary storage devices – magnetic and optical media. Input and output modules. OMR, OCR, MICR, scanner, mouse, Modem.
Module III
Computer hardware and software.Machine language and high level language.Application software.Computer program.Operating system.Computer virus, Antivirus and Computer security, Windows OS and its features.
Computer arithmetic.Binary, octal and hexadecimal number systems.Algorithm and flowcharts.Illustrations.Elements of database and its applications.

Module IV
Introduction to MS office Packages- Ms-Word – Editing a Document – Move and Copy text – Formatting text and paragraph – Finding and Replacing text and spelling checking – Using tabs, Tables, and other features, Enhancing document – using mail merge and other features.
Introduction to Worksheet- Getting started with excel – Editing Cells and using commands and functions – Moving And Coping, Inserting and Deleting Rows and Columns – Getting help and formatting a worksheet – Printing the worksheet – Creating Charts – using formulae and functions in excel.
Introduction to Power Point Presentation
Module V
Computer Networks & Internet Technology

Examination Scheme:

Components	A	P	HA	CT	EE
Weightage (%)	5	5	5	15	70

A-Attendance; **P** -Project/Seminar/Quiz/Viva; **HA**-Home Assignment; **CT**-Class Test; **EE**-End Semester Examination
Text & References:
- Craig Stinson "Running Microsoft Windows-98" – Microsoft press.
- Joshua C. Nossiter. " Using Excel – 5 for Windows"

- "Working with Word" – Aptech Computer Education
- "Power Point Presentation" – Aptech Computer Education.
- Malhotra, Computer Applications in Business
- Rajaraman V, Analysis and Design of Information System, Prentice Hall of India, New Delhi
- Murdick, RG and Ross, JE Information Systems for Modern Management
- Kanter, J, Management Oriented MIS, Prentice Hall of India
- Bhattacharya SK, Management Planning and Information Systems

FOOD BIOTECHNOLOGY

Course Code: BTH2108   **Credit Units: 03**

Course Objective:
This course will provide a broad grounding in concepts, techniques and issues involved in food products and their processing.

Course Contents:

Module I: Introduction
Scope and importance of food industry; Concept of 'functional food'; Advances and trends, ethical issues, quality control, legislation, FDA & FPO (India), RDT and other technologies involved in development of food products; GM food and GM crops.

Module II: Techniques used in Food Industry
Sterilization, isolation, screening and strain improvement, cell harvesting and disruption, recovery and purification, production of organic acids – citric acid, lactic acid and acetic acid;

Module III: Dairy Biotechnology
Starter cultures, prebiotics, probiotics – their use as flavor enhancers and disease/ infection combats, applications in production of cheese, butter, ice-cream, yoghurt; Modified milk proteins.

Module IV:Microbial, Plant and Animal Biotechnology
Production of SCP (Single cell protein), production of baker's yeast, brewing industry, applications of transgenic plants in food production, transgenic fish, and transgenic poultry.

Examination Scheme:

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

Text & References:

*Text***:**
- Food Biotechnology - 2. 1988. R.D. King and P.S.J. Cheetham (Eds.). Elsevier Applied Science, NY.

*References***:**
- Introduction to Food Biotechnology. Green, Perry Johnson. 2002. CRC Press, Boca Raton, Florida.
- Food Biotechnology-Techniques and Applications. Gauri S. Mittal. 1992. Technomic Publishing Co., Inc., Lancaster, PA.

AGRICULTURE BIOTECHNOLOGY

Course Code: BTH2109   **Credit Units: 03**

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: AraKirakosyan 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.

TERM PAPER

Course Code: BTH2131   **Credit Units: 02**

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:
f) Show evidence of what an author has said.
g) Avoid misrepresentation through restatement.
h) Save unnecessary writing when ideas have been well expressed by the original author.
i) 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.

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: BTH2132   **Credit Units: 03**

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: BTH2133   **Credit Units: 01**

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 atleast 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

MOLECULAR MODELING

Course Code: BTH2209   **Credit Units: 03**

Course Objective:
Course objective is to provide the knowledge that should be useful to understand different concepts of molecular properties of basic life molecules like proteins nucleic acids and their relative structure and function across the genus orkingdom

Module I:
Introduction to Molecular modeling, data bases for proteins and DNA – PDB and MMDB, structure file formats, visualizing structural information, advance structure modeling, Internal and external co-ordinate system, cartesian and cylindrical polar co-ordinate system, Potential energy calculations using semiempirical potential energy function,

Module II:
Software and Programmes for sequence comparision and analysis, Phylogenetics analysis software, Molecular Structure drawing tool,

Module III:
Molecular modeling/Docking, Molecular mechanics and dynamics, Knowledge base structure prediction, Molecular Design, structure similarity searching; Secondary structure prediction in proteins, prediction of buried residues in proteins

Module IV
Application of molecular modeling&computational biology/Bioinformatics in Agriculture, Human health, Environment, Biotechnology, Molecular Biology, Neurobiology, Drug Designing, Veterinary Science.

Examination Scheme:

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

Text & References:

Text:
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press.

*References***:**
- Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology, D. Gusfield, Cambridge University Press.
- Biocomputing hypertext coursebook at http://www.techfak.unibielefeld.de/bcd/Curric/welcome.html/
- Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, A.D. Baxevanis and B.F.F. Ouellette, Wiley-interscience.

- Computational Modeling of Genetic and Biochemical Networks, J.M. Bower and H. Bolouri, MIT Press
- Computational Molecular Biology: An Algorithmic Approach, P.A. Pevzner, MIT Press
- Computer Methods for Macromolecular Sequence Analysis, R.F. Doolittle, J.N, Abelson, M.I. Simon, Academic press
- Essentials of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons Inc.
- Introduction to Bioinformatics, T. Attwood and D. Parry-Smith, Prentice Hall
- Introduction to Computational Biology: Maps, Sequences and Genomes, M. Waterman, Chapman and Hall
- Sequence Analysis in Molecular Biology: Treasure Trove or Trivial Pursuit, G. V. Heijne and G.V. Heijne, Academic Press

BIO-SAFETY & BIOETHICS

Course Code: BTH2210   **Credit Units: 03**

Course Objective:
The objectives of the course are to explain the biosafety and bioethics. Students will study and assess biosafety, and bioethics related to genetically engineered plant, animal and microbial products.

Course Contents:

Module I: Biosafety
Definition and requirement; biosafety in relation to human health, environment, transgenic research and applications, biosafety laws, guidelines and conventions, biosafety regulation: principles and practices in microbial and biomedical labs, guidelines for research involving DNA molecule ; Regulation bodies at National and International level

Module II Bioethics
Defination of bioethics, importance of bioethics, Bioethics in plant, animal and microbial genetic engineering, Ethical issues in healthcare, Biopiracy and ethical conflicts Legal and socioeco'nomic impact of the products and techniques in Biotechnology,

Examination Scheme:

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

Text & References:

Text:
- *Coyles information highway handbook;* A Practical File on the New Information Order, American Library Association, 2000.
- *American Indian Cultural & Research Journal (UCLA)*

References:
- Refer to Periodicals, Industry directories, Articles and report in journals on the regulatory issues,
- "Biotechnology" series by Rehm& Reed.

BIOINFORMATICS

Course Code: BTH2211   **Credit Units: 03**

Course Objective:
The course involves a basic understanding of computer and bioinformatics tools and skills in the field of biology.

Course Contents:
Module I: Computers
General introduction (characteristics, capabilities, generations), software, hardware : organization of hardware (input devices, memory, control unit arithmetic logic unit, output devices); software : (System software; application software, languages -low level, high level), interpreter, compiler, data processing; batch, on-line, real-time (examples from bioindustries; e.g. application of computers in co-ordination of solute concentration, ph, temperature, etc., of a fermenter in operation); internet application.

Module II: Basic Bioinformatics
Introduction to Internet, Search Engines (Google, Yahoo, Entrezetc)

Module III: Biological Databases
Sequence databases (EMBL, GenBank, DDBJ, -UNIPROT, PIR, TrEMBL), Protein family/domain databases (PROSITE, PRINTS, Pfam, BLOCK, etc), Cluster databases-An Introduction, Specialised databases (KEGG, etc), Database technologies (Flat-file), Structural databases (PDB)

Module IV:
Trees-splits and metrices on trees, tree interpretation, Distance – additive, ultrameric and nonadditive distances, tree building methods, phylogenetic analysis.

Examination Scheme:

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

Text & References:

Text:
- Computer Science, J.G. Brookshear, Pearson, Addison Wesley
- Introduction to Bioinformation – T.Attawood

References:
- A book on C by Kelley : Programming in C, Addison-Wesley Publishing
- Introduction to C++ for Engineers and Scientists, Prentice-Hall
- Schaum's Outline of Introduction of Computer Science, P. Cushman and R. Mata-Toledo, McGraw Hill Trade
- Bioinformatics – Managing Scientific Data, Zoe' Lacroix and Terence Critchlow
- Bioinformatics – Sequence, Structure and Databanks, Des Higgins & Willie Taylor
- Structural Bioinformatics, Philip E. Bourne, Helge Weissig 2003
- Statistical Methods in Bioinformatics: An Introduction, G.R. Grant, W.J. Ewens, Springer Verlag

TERM PAPER

Course Code: BTH2231   **Credit Units: 02**

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

j) 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.
k) Read the paper to ensure that the language is not awkward, and that it "flows" properly.
l) Check for proper spelling, phrasing and sentence construction.
m) Check for proper form on footnotes, quotes, and punctuation.
n) Check to see that quotations serve one of the following purposes:
o) Show evidence of what an author has said.
p) Avoid misrepresentation through restatement.
q) 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:
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.

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: BTH2232   **Credit Units: 03**

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: BTH2233   **Credit Units: 01**

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 atleast 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

BIOCHEMISTRY LAB

Course Code: BTH2305   **Credit Units: 01**

Course Contents:

Module I: Solutions and buffers
Preparation of molar, normal and % (w/v) solutions preparation of buffers of different pH and molar strength.

Module II: Carbohydrates
Extraction and estimation of carbohydrates from given plant/animal materials: determination of total sugars by Anthrone method Separation of sugars by thin layer chromatography

Module III: Proteins
Extraction of total proteins; Estimation of proteins by Lowery/ Bradford Method; Elctrophoretic (SDS-PAGE) separation of isolated proteins

Module IV: Lipids
Extraction of total lipids; estimation of phospholipids/glycolipids; thin layer chromatographic separation of lipids

Module IV: Nucleic Acid
Extraction and estimation of DNA and RNA by UV-spectrophotometer

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:
• Practical book of Biochemistry by Plummer
• Practical book of Biochemistry by S.K. Sawhney and Randhir Singh

GENETICS & CELL BIOLOGY LAB

Course Code: BTH2308   **Credit Units: 01**

Course Contents:

Module I
Cell fractionation and separation of cell organelles by   ultra centrifugation.

Module II
Isolation of chloroplast from spinach

Module III
Isolation of mitochondria.

Module IV
Study of apoptosis by TUNEL method.
Site directed mutagenesis
Mutation detection and analysis
Mitosis
Meiosis

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

ITELLECTUAL PROPERTY RIGHTS

Course Code: BTH2309   **Credit Units: 03**

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, Copyrights, Trademarks, Industrial Designs, Geographical Indications and International Conventions, Biosafety and Bioethics

Course Contents:

Module I
General Overview of Intellectual Property Rights, WIPO, WTO, Trade Related Intellectual Property Rights.

Module II
Patent - Basic requirements of Patentability, Patentable Subject Matter, Procedure for Obtaining Patent, Provisional and Complete Specification

Module III
Copyright - Objectives of copyright, Rights conferred by registration of copyright, Infringement of copyright

Module IV
Trademarks-Basic Principles of Trademark, Rights conferred by Registration of Trademark, Infringement of Trademark

Module V
Geographical Indications-Objectives of Geographical Indications, Rights conferred, Infringement of Geographical Indications, International Position, Indian Position, Bioprospecting and Biopiracy.

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 Brigitte Anderson, Edward Elgar Publishing
- Intellectual Property Rights and the Life Sciences Industries by Graham Dutfield, Ashgate Publishing
References:
- WIPO Intellectual Property Handbook
- Intellectual Property Rights by William Rodelph Cornish, David Clewelyn
- Journals and Current magazines

PHARMACEUTICAL BIOTECHNOLOGY

Course Code: BTH2310   **Credit Units: 03**

Course Objective:
The objective of this course to apply the basic concepts in the specific field of Pharmaceutical Biotechnology Industry. The student will gain insight into the working of a pharma industry, various classes of biotech products and the regulations governing production and marketing of pharmaceutical products.

Course Contents:

Module I
Introduction and History, Drug Discovery Process, Methods of Drug Discovery and development.

Module II
Physicochemical Properties, Effects of route of administration, Drug Targets, Pharmacokinetics and pharmacodynamics of drugs, Drug Toxicity.

Module III
DNA vaccines, Vaccines & Monoclonal antibody based pharmaceuticals, Antibiotics,Characterisation and Bioanalytical aspects of Recombinant proteins as pharmaceutical drugs**.**

Module IV
Formulation of Biotechnological Products, Drug Delivery, Examples of some Biotecnhological products in clinical development

Module V: Regulations
Role of FDA, ICH Guidelines, cGMP, The Regulation of Pharmaceutical Biotechnological Products and Ethical Issues.

Examination Scheme:

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

Text & References:
Text:
- Pharmaceutical Biotechnology - by Oliver. Kayser, Rainer Helmut Müller Series: Pharmaceutical Biotechnology , Vol. 9 Pearlman, Rodney; Wang, Y. John (Eds.) 1996.

References:
- Development and Manufacture of Protein Pharmaceuticals Series: Pharmaceutical Biotechnology , Vol. 14Nail, Steve L.; Akers, Michael J. (Eds.) 2002
- Pharmaceutical Biotechnology: Fundamentals and Applications, Third Edition, Editor Daan J.A. Crommelin, Robert D Sindelar.
- Pharmaceutical Biotechnology, Vyas, S. P., CBS Publishers & Distributors, 2002, Delhi

CLINICAL BIOTECHNOLOGY

Course Code: BTH2311   **Credit Units: 03**

Course Objective:
To develop an understanding of role of biochemistry and molecular biology in the diagnosis and clinical management of disease

Course Contents:
Module I
Clinical significance of biochemical tests and their role in the diagnosis and monitoring of disease, Clinical characteristic of disease. Role of clinical biochemistry in detection, diagnosis of diseases

Module II
Genetic disease, example of genetic diseases.transplantation/gene therapy.

Module III
Clinically important taxonomic grouping of bacteria, etiology, transmission;Epidemics, pandemics and endemics disease. Control measure of microbial diseases. Hygiene regulations.

Module IV
Manipulation of reproduction and development for application in medicine, agriculture, aquaculture and conservation.

Module V
Management of Clinical Data.

Examination Scheme:

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

Text & References:
Text:
- Marshall, W J, Clinical Chemistry, 3rd edition, Mosby, 1997.
- Harper's Biochemistry K. Robert, M.D. Murray, D.K. Granner, P.A. Mayes and V.I. Rodwell, McGraw Hill/ Appleton and Lange

*References***:**
- Sudbery, P. Human molecular genetics. Addison Wesley Longman (1998)
- Principles of Biochemistry, A.L. Lehninger, D.L. Nelson, M.M. Cox. , Worth Publishing
- Principles of Physical Biochemistry, K.E. Van Holde, W.C. Johnson, Prentice Hall
- Tools of Biochemistry, T.G. Cooper, John Wiley and Sons Inc.
- Enzymes Biochemistry, Biotechnology, Clinical Chemistry, Trevor Palner
- Biochemistry (Fifth Edition), LubertStryer
- Physical Biochemistry, David Freifeider
- Annual Review of Biochemistry (1995-2004)
- Enzyme Kinetics: Behaviour and Analysis of Rapid Equilibrium and Steady State Enzyme Systems, I.H. Segel, Wiley-Interscience
- Industrial Enzymes & their applications, H. Uhlig., John Wiley and Sons Inc.

TERM PAPER

Course Code: BTH2331   **Credit Units: 02**

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

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.

y) Avoid misrepresentation through restatement.

z) Save unnecessary writing when ideas have been well expressed by the original author.

aa) 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.

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: BTH2332   **Credit Units: 03**

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: BTH2333   **Credit Units: 01**

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 atleast 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

MOLECULAR BIOLOGY

Course Code: BTH2401   **Credit Units:03**

Course Objective:
The objective of the course is to provide a clear understanding of DNA (genetic material) so that they can manipulate it and understand basic tools and techniques involved in its manipulation. Strong foundation in molecular biology enables the students to familiarize themselves with Genetic engineering technology.

Course Contents:

Module I: DNA replication and repair
DNA structure, DNA replication; DNA repair mechanism,

Module II: Transcription of DNA
Transcription in prokaryotes and eukaryotes, RNA polymerase – Composition and function; transcription mechanism; transcription factor and their role, inhibition of RNA synthesis

Module III: Processing of RNA
Procession of ribosomal and transfer RNA''s processing of mRNA-5'cap formation; 3' polyadenylation ; RNA splicing , RNA editing , RNA degradation.

Module IV: Translation
Translation mechanism in prokaryotes and eukaryotes; ribosomes, initiation of translation, elongation, termination, amino acid activation; inhibitors, post translation modification of protein.

Module V: Regulation of gene expression
Regulation in prokaryotes – repressors and negative control, positive control, role of c AMP, **Ampreceptor**protein, lac, tryp, His and ara operons, Regulation in Eukaryotes=promoters and enhancers, transcriptional regulatory protein, transcriptional activators, eukaryotic repressor.

Module VI: Gene Silencing
Antisense molecules; Biochemistry of ribozyme,
Hammer head, hairpin ribozymes. Application of antisense and ribozymes in genetic engineering.

Examination Scheme:

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

Text & References:

Text:
- Concepts of Genetics, W.S. Klug, and M.R. Cummings 2004, Pearson Education

References:

- Genome, T.A. Brown, John Willey & Sons Inc.
- Molecular Biology of the Cell by Alberts Bruce, Bray Demos, and Watson James D.
- Gene VIII, Benjamin Lewin 2005, Oxford University Press
- Molecular Cell Biology, H. Lodish, A. Berk, S. Zipursky, P Matsundaira, D. Baltimore and J.E. Barnell, W.H. Freeman and Company.
- Molecular Cloning: A Laboratory Manual (3-Vilcume set), J. Sambrook, E.F. Fritsch and T. Maniatis, Cold spring Harbor Laboratory Press.
- Molecular Biology of the Gene, J.D. Watson, A.M. Weiner and N.H. Hopkins, Addison-Wesley Publishing.
- Introduction to Practical Molecular Biology, P.D. Dabre, John Wiley and Sons Inc.

INSTRUMENTATION & BIOANALYTICAL TECHNIQUES

Course Code: BTH2403   **CreditUnits: 02**

Course Objective:
The students will be exposed to basic concepts related with techniques and instrumentation widely used in Biotechnology.

Course Contents:
Module I: Buffers & Sample preparation
Preparation of solutions, concept of pH and buffer, types of buffers and their preparation, pH meter.Cell Disruption techniques, ultra filtration, dialysis and reverse osmosis.

Module II: Centrifugation
Principle of centrifugation, rotors, different types of centrifuges, ultra centrifugation

Module III:Microscopy
Principles of microscopy, types of microscopy Bright field, Dark field, phase contrast and fluorescence microscopy.Electron microscopy: Transmission and scanning electron microscopy.

Module IV: Radioisotope techniques
Study of radioisotopes in biological samples, proportional and GM counter, scintillation counters, autoradiography.

Module V:Electrophoresis & Chromatography
SDS-PAGE, isoelectric focusing, two-dimensional electrophoresis; Paper, TLC, gel filtration, ion-exchange chromatography, affinity chromatography, HPLC and GLC

Module VI: Spectroscopy
UV and visible spectroscopy,Infrared and Atomic absorption spectroscopy, fluorescence spectroscopy.

Examination Scheme:

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

Text & References:
Text:
- Principles of Physical Biochemistry, K.E. Van Holde, Prentice Hall.
- Essentials of Biophysics, P. Narayanan, New Age International Publishers
References:
- Advanced Instrumentation, Data Interprtation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press
- Crystallography made Crystal Clear, G. Rhodes, Academic Press
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.
- NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry, H. Gunther, John Wiley and Sons Ltd.

RESEARCH METHODOLOGY

Course Code: BTH2404   **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 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
Types of sampling, Steps in sampling; Advantages and limitations of sampling. Collection of Data;; 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

IN SILICO ANALYSIS OF BIOMOLECULES

Course Code: BTH2405   **Credit Units: 02**

Course Objective: The objective is to describe relational data models and database management systems with an emphasis on biologically important techniques to store various data on DNA sequencing structures genetic mapping etc.

Course Content:
Module I: Introduction and overview
The NCBI data model; sequence databases, sequence retrieval, sequence file formats, submitting DNA and protein sequences. Types of biological databases, Databases and rapid sequence analysis

Module II: Sequence alignment
Global and local alignments, Pairwise and multiple alignment, programs and methods for sequence alignment, pattern searching programs, family and superfamily representation, structural inference, dynamic programming algorithms, alignment by hidden Markov models,

Module III: Phylogenetic prediction
Phylogenetic analysis, parsimony, tree evaluation, maximum likelihood trees, analysis software.

Module IV: Predictive methods using DNA and protein sequences
ESTs – databases, clustering, gene discovery and identification, and functional classification.
Protein identification, physical properties, motifs and patterns, structure,

Examination Scheme:

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

Text & References:

Text:
- Essentials of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press

References:
- Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology, D. Gusfield, Cambridge University Press
- Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, A.D. Baxevanis and B.F.F Quellette, Wiley – interscience.
- Bioinforamtics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press.
- Sequence Analysis in Molecular Biology: Treasure Trove or Trivial Pursuit, G. Von Heijne and G. Von Heijne, Academic Press.

MOLECULAR BIOLOGY LAB

Course Code: BTH2406   **Credit Units: 01**

Course Contents:

1. Isolation of genomic DNA.
2. Isolation of plasmid DNA.
3. Isolation of eukaryotic total RNA.
4. Study of in vitro transcription.
5. Invitro study of translation

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

IN SILICO ANALYSIS OF BIOMOLECULES LAB

Course Code: BTH2408   **CreditUnits: 01**

Course Contents:
1. Basics of sequence analysis Retrieving a sequence-nucleic acid/Protein
2. Local and Global Alignment- concepts Pair wise sequence alignment
3. Multiple sequencealignment
4. Dynamic Programming – Smith Watermann Algorithm Needleman Wunsch Algorithm
5. Motif and pattern searching
6. Phylogentic prediction and analysis
7. Structure predication
8. Finding transcription regulatory signals
9. 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

NANOBIOTECHNOLOGY

Course Code: BTH2409   **Credit Units: 03**

Course Objective:
Nanotechnology is one of the most important emerging fields in today's scenario and holds tremendous potential in the field of Biotechnology. The objective of this course is to introduce this emerging field to the students so that they can apply this to develop new drug delievery systems and biomarkers.

Course Contents:

Module I: Introduction to Nanotechnology
Overview of nanotechnology developments, different nanostructured materials, properties related to nanostructured surfaces, atomic theory and bonding, quantum theory, electromagnetic properties of matter, molecular structure and macromolecules, intramolecular and intermolecular forces, solubility and solvation, thermodynamics and fluid behaviour.

Module II: Nanostructured Materials
Choice of nanomaterials, carbon nanotubes and nanowires, Physical characteristics of nanomaterials and nanostructured surfaces, quantum dots, nanostructured thin films, pattern sufaces, composites, mangnetic nanoparticles, scaffolds, gels and drug delivery systems.

Module III: Nanobiostructure Systems – Drug Delivery
The assembly of drug delivery systems, preparation and assembley of pharmaceutical molecule into nanometric material within the parameters of GLP and health and safety standards.

Module IV: Nanobiostructure Systems - Biosensor
The functional assembling of the components of a nanostructured biosensor, putting together a bioreceptor and putting together nanometric support and a signal transduction system.Assembly and production of a nanobiosensor.

Examination Scheme:

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

Text & References:
- Molecular Engineering of Nanosystems by Edward A. Rietman.
- Nanobiotech- Concepts, Applications and Perspectives, Christot, Chad Mirkin.
- Nanoscale Science and technology, Robert W Kelsall, Mark Geoghegan, Ian W Hamley.
- Nano surface chemistry, Morton Rosoff.

FORENSIC BIOTECHNOLOGY

Course Code: BTH2410   **CreditUnits: 03**

Course Objective:
An introduction to forensic science and application of biotechnology in Forensic sciences can be understood by studying the various modules of this paper.

Course Contents:
Module I
History and Development of Forensic Science, Definition of Forensic Science, Scope of Forensic Science, Need of Forensic Science, Basic Principles of Forensic Science, Tools and Techniques of Forensic Science.
Module II
Organizational setup of Forensic Science Laboratories, CFSL, FSL, GEQD, FPB, NICFS, Central Detective Training School, NCRB (Maintenance of Crime Records), NPA Mobile Forensic Science Laboratory, Branch of Forensic Science,

Module III
Modus Operandi and MOB and its role in Criminal Investigation,Methods of Investigation: Narco analysis; Hypnosis etc. Limitations and legal aspects.
Brain fingerprinting, Criminal Profiling, Profile of the victim and culprit,investigative strategy, crime scene characteristics,criminal behavior on the internet, limitations.

Module IV
Education of Forensic Science, Role of Media, Human Rights & Criminal JusticeSystem.
Ethics in Forensic Science, Duties of Forensic Scientist, History and Development of Finger Print as Science for Personal Identification,Type of Finger Prints, Classification of Finger Prints
Presentation of Expert Evidence: Data, Reports, Evidence in the Court.
Module VII:
MLP, SLP technology, PCR technology in crime detection, STR and databases, mitochondrial DNA and Y chromosome analysis in forensic science, DNA chip technology, role of molecular biology and biotechnology in crime detection.

Text & References:
- Nanda, B.B. and Tewari, R.K. (2001) : Forensic Science in India : A visionfor the twenty first century Select Publisher, New Delhi.
- James, S.H and Nordby, J.J. (2003) Forensic Science : An introduction toscientific and investigative techniques CRC Press,
- Barnett (2001): Ethics in Forensic Science.
- O'Hara &Osterburg : Introduction to Criminalistics, 1949, The MacMillanCo., 1964.
- Osterburg: Crime Laboratory.
- Saferstien: Forensic Science, Handbook, Vol. I, II & III, Prentice Hall Inc.USA.
- Saferstein: Criminalistics, 1976, Prentice Hall Inc., USA.
- Nickolas : Scientific Criminal Investigation
- Deforest, Gansellen& Lee: Introduction to Criminalistics.
- Sharma, B.R. : Forensic Science in Criminal Investigaion and Trials, CentralLaw Agency, Allahabad, 1974.

- Kirk : Criminal Investigation, 1953, Interscience Publisher Inc. New York.
- Molecular Biology and Biotechnology, 4thEdn, J.M Walker and R. Rapley, Panima Books

GENETICALLY MODIFIED ORGANISM

Course Code: BTH2411   **CreditUnits: 03**

Course Contents:
Module I
Microbial genetic engineering, genetically modified microbes of industrial importance.

Module II
Plants genetic engineering, Transgenic crop with new traits-herbicide tolerance, insect and disease resistance,Therapeutic proteins and compounds; Molecular farming of biopharmaceuticals.

Module III
Animal genetic engineering; Transgenic animals with new traits, transgenic animals as bioreactors for producing pharmaceutically important compounds and therapeutic etc.

Module IV
Detection and diagnosis of genetically modified organisms.

Text & References:
- Principles of Fermentation Technology, Salisbury, Whitaker and Hall, Aditya Books Pvt. Ltd.
- Industrial Microbiology, Casida, New Age International
- Industrial Microbiology, Prescott and Dunn, C.B.S. Publishers Principles of Microbiology, R.M. Atlas, WMC. Brown Publisher
- Plant Biotechnology and Transgenic Plants, K.M.O. Caldenty, W.H. Barz and H.L. Wills, Marcel Dekker
- Plant Biotechnology, J. Hammond, P.McGarvy and V. Yusibov, Springer Verlag.
- Culture of Animal Cells, R.I Freshney, Wiley-Leiss
- Comprehensive Biotechnology, Moo-Young, Alan T. Bullm Howard Dalton, Panima Publication

TERM PAPER

Course Code: BTH2431   **Credit Units: 02**

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

bb) 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.

cc) Read the paper to ensure that the language is not awkward, and that it "flows" properly.

dd) Check for proper spelling, phrasing and sentence construction.

ee) Check for proper form on footnotes, quotes, and punctuation.

ff) Check to see that quotations serve one of the following purposes:

gg) Show evidence of what an author has said.

hh) Avoid misrepresentation through restatement.

ii) Save unnecessary writing when ideas have been well expressed by the original author.

jj) 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.

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: BTH2432   **Credit Units: 03**

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: BTH2433   **Credit Units: 01**

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 atleast 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

STEM CELL AND GENE THERAPY

Course Code: BTH2503   **CreditUnits: 03**

Course Objective:
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
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 II:
Introduction to Gene Therapy, History and evolution of Gene therapy, optimal disease targets, Failures and successes with gene therapy and future prospects, Gene transfer methods

Module III
Innate and Acquired Immune Response to Cell and Gene Therapy,

Module IV

Cell, Disease, and Genetic Perspectives for Gene Therapy, Promise of Stem Cell-Based Therapies, Stem Cells and Diabetes, Stem Cells and heart Repair

Module V
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 AluízioBorém, 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,

MARINE BIOTECHNOLOGY

Course Code: BTH2504   **CreditUnits: 03**

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.

BIOSENSORS

Course Code: BTH2505   **CreditUnits: 03**

Course Objective:
On completion of the module students should Be able to Appreciate the basic configuration and distinction among biosensor systems, To gain an understanding of general biosensor principles and terms, To be able to design, model, simulate, fabricate, and test a biosensor, To gain an overall knowledge of biosensor types, applications, requirements, and capabilities to allow improved interaction with physicians, clinicians, and biomedical engineers, and to enable the student to conduct biomedical engineering research.

Course Contents:

Module I: Biosensors
Definition, History, Properties of biosensors, Design features of Biosensors, The Biological Component, SignalTransduction: Amperometric Biosensors, Potentiometric Biosensors, Detection of H+ cation, Detections ofNH^{4+}cation, Detection of CN- anion, Calorimetric biosensors, Optical Biosensors, Measuring the change inlight reflectance, Measuring luminescence, Pizo-electric biosensors, Immunosensors, Commercial examples of biosensors. Biosensors markets- Opportunities and obstacles.

Module II: Biomedical sensors
Sensors and transducers: an overview, measurement systems, Classification of Biomedical sensors andtransducers, who do we need Biomedical sensors and Transducers? Important Design considerations and systemcalibration, the future of Biosensors and Transducers, Sensing Layer: The importance of computers in sensors and Transducer technology, Recent Engineering Solutions to Health care using Biosensors and Transducers, Modern health care solutions.

Examination Scheme:

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

Text & References:

Text:
- Affinity Biosensors: Techniques and Protocol by K.R. Rogers and A. Mulchandani, Humana Press.
- Biosensors and their Applications by V.C. Yang and T.T. Ngo, Plenum Publishing Corporation.
- Chemical Sensors and Biosensors by B.R. Eggins, John Wiley and Sons Inc.

References:

- Sensors and Sensing in Biology and Engineering by F.G. Barth, wt al, Springer Verlag.
- Biosensors by Minh Canh. Tran
- Biosensors: Theory and Applications by Donald G. Buerk
- Enzyme and Microbial Biosensors: : Techniques and Protocols - by Kim R. Rogers, Ashok Mulchandani
- Biosensors in Environmental Monitoring - by Ursula Bilitewski, Anthony P. F. Turner.
- Biosensors: Micro electrochemical Devices - by Marc J. C. Lambrechts
- Biosensors with Fiberoptics - by Donald Lee Wise, Lemuel B. Wingard
- Biosensors and Their Applications - by That Tjien Ngo, Victor Chi-Min Yang
- Thermal Biosensors, Bioactivity, Bioaffinity -by Prakash K. Bhatia
- Novel Approaches in Biosensors and Rapid Diagnostic Assays - by ZviLiron, Avraham Bromberg, Morly Fisher
- Biosensors - by Anthony E. G. Cass.

BIOFUEL AND GREEN BIOTECHNOLOGY

Course Code: BTH2507   **Credit Units: 03**

Course Objective:
This course will acquaint the students with bioenergy resources, their properties, preparation, processing alongwith the details of equipments utilized for the purpose.

Course Contents:
Module I: Biomass Sources, Characteristics & Preparation: Biomass Sources and Classification
 Chemical composition and properties of different biomass materials and bio-fuels – Sugar cane molasses for fermentation ethanol; Sources and processing of oils and fats for liquid fuels- Energy plantations - Preparation of woody biomass; Drying, Storage and Handling of Biomass.

Module II: Biogas Technology
Feedstock for biogas production, biodegradable organic matter,Operating parameters for biogas production, Dry and wet fermentation

Module III: Bio-Ethanol and Bio-Diesel Technology
Production of Fuel Ethanol by Fermentation of Sugars.Trans-esterification of Oils to Produce Bio-Diesel.

Module IV: Pyrolysis and Gasification of Biomass
Thermo-chemical conversion of ligno-cellulose biomass - Pyrolysis of biomass,Thermo-chemical gasification principles

Module V: Combustion of Biomass and Cogeneration Systems
Combustion of Woody Biomass, Cogeneration in Biomass Processing Industries.Use of biogases for cogeneration.

Examination Scheme:

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

Text & References:
*Text***:**
- Biotechnology and Alternative Technologies for Utilization of Biomass or Agricultural Wastes, A. Chakravarthy, Oxford & IBH publishing Co., New Delhi, 1989.

*References***:**
- Biogas Systems: Principles and Applications, K.M. Mital, New Age International Publishers (p) Ltd., 1996.
- Biomass Energy Systems, P. VenkataRamana and S.N. Srinivas, Tata Energy Research Institute, New Delhi, 1996.
- Fuels from Biomass and Wastes, D.L. Klass and G.M. Emert, Ann Arbor Science publ. Inc. Michigan, 1985.
- Bio-gas Technology, Khandelwal K.C. and Mahdi, Tata McGraw-Hill pub. Co. Ltd., New Delhi
- Advances in bio-gas Technology, O.P. Chawla, I.C.A.R., New Delhi. 1970.

ARTIFICIAL NEURAL NETWORKS

Course Code: BTH2508   **Credit Units: 03**

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

TERM PAPER

Course Code: BTH2531   **Credit Units: 02**

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

kk) 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.

ll) Read the paper to ensure that the language is not awkward, and that it "flows" properly.

mm)   Check for proper spelling, phrasing and sentence construction.

nn) Check for proper form on footnotes, quotes, and punctuation.

oo) Check to see that quotations serve one of the following purposes:

pp) Show evidence of what an author has said.

qq) Avoid misrepresentation through restatement.

rr) Save unnecessary writing when ideas have been well expressed by the original author.

ss) 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.

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: BTH2532   **Credit Units: 03**

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: BTH2533   **Credit Units: 01**

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 atleast 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 – Six Semester

RECOMBINANT DNA TECHNOLOGY

Course Code: BTH2601   **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
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); Basic cloning strategy and screening clones; Gene libraries

Module III
Blotting techniques and hybridization:Southern, Northern and Western blotting techniques.Radioactive and non-radioactive probes.

Module IV
Principles of PCR, types of PCRsand its applications

Module V
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.

INDUSTRIAL BIOTECHNOLOGY

Course Code: BTH2603   **Credit Units: 03**

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 – Prescot&Duhn.

RECOMBINANT DNA TECHNOLOGY LAB

Course Code: BTH2605   **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
Studyof cloning

Module II
Study of PCR

Module III
Study of Southern hybridization

Module IV
Study of RAPD

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

DRUG DESIGN AND DEVELOPMENT

Course Code: BTH2607   **Credit Units: 03**

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, Enzymes involved in nucleic acid metabolism, Signal transduction across membraneGPCR, small molecule receptors, neuropeptide receptors, ion channels.

Module II: Target discovery and validation strategies
New target discovery, biological activity, types of screening, natural products, General overview of validation techniques.

ModuleIII: Structure-based design
Drug design to discovery and development, drug metabolism, toxicity and pharmacokinetics, problems and drawbacks on drug discovery and development.

Module IV: Basic concepts of Drug Delivery
Basic terminologies in drug delivery and drug targeting, Concepts of Bio availability, Process of drug absorption, Drug delivery considerations for the new biotherapeutics
Introduction to routes of administration of drugs

Module V: Delivery of Genetic material
New generation technologies in genetic drug delivery, Nanotechnology, Genetically engineered cell implants in drug deliver.

Examination Scheme:

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

Text & References:

- 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
- 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 Livingston.
- 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.
- Drug Delivery: Engineering Principles for Drug Therapy (Topics in Chemical Engineering), W.M. Saltzman, Oxford University Press.
- Handbook of Biodegradable Polymers (Drug Targeting and Delivery), A.J. Domb, J. Kost and D.M. Wiseman, Dunitz Martin Ltd.

TERM PAPER

Course Code: BTH2631   **Credit Units: 02**

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
- 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.
- Begin by making a list of subject-headings under which you might expect the subject to be listed.
- 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.
p) Get facts, not just opinions. Compare the facts with author's conclusion.
q) In research studies, notice the methods and procedures, results & conclusions.
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4. Outlining the paper
k) Review notes to find main sub-divisions of the subject.
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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

tt) 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.

uu) Read the paper to ensure that the language is not awkward, and that it "flows" properly.

vv) Check for proper spelling, phrasing and sentence construction.

ww)   Check for proper form on footnotes, quotes, and punctuation.

xx) Check to see that quotations serve one of the following purposes:

yy) Show evidence of what an author has said.

zz) Avoid misrepresentation through restatement.

aaa)   Save unnecessary writing when ideas have been well expressed by the original author.

bbb)   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:

u) summary of question posed

v) summary of findings

w) summary of main limitations of the study at hand

x) 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.

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Unpublished theses/ dissertations
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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: BTH2632   **Credit Units: 03**

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: BTH2633   **Credit Units: 01**

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 atleast 500 words about the learning outcome of 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