Master of Science- Bioinformatics

Syllabus - First Semester

FUNDAMENTALS OF COMPUTING

Course Code: BIF4107 **Credit Units : 02**

Course Contents:

Module-I:

Overview and organization of a computer system, storage, devices, memory, etc, Types of Processing: Batch, Real-Time, Online, Offline, Types of modern computers: The workstation, The Minicomputer, Mainframe Computers, Parallel Processing Computer, The Super Computer, etc

Module-II:

Software concepts: Concepts of flowcharting, Algorithm development, Relationship between hardware and software, Types of software: System software and Application software.
Operating Systems: Introduction, Process management, Memory management, File management, Device management and Security. Introduction to Windows/Unix/Linux.

Module-III:

Computer Networking: OSI Reference Model, topologies and protocols, designing networks, Networking gadgets (Router, Switch, etc); Data Communication (ISDN, VPN, DSL, cable modem, cellular modem, etc); Communication Links (Wire pairs, Coaxial cables, Fiber optics, Microwave, Satellite, etc)

Module-IV:

Internet: The Internet and its Resources, Internet protocols, services, and related terminologies. Web browsers, customizing browsers, Blocking popup windows, Internet
programming languages.

Module-V:

Data security: Data security fundamentals: types of attacks, firewall, packet filtering, classification of data security threats, protection mechanism (authentication, access control, access rules), Encryption/Decryptions techniques, An overview of Computer viruses: How do they get transmitted? What are the dangers? General Precautions to be taken, Current & future technologies (Grid Computing, VPN, wireless, mobile computing, biometrics etc.)

Examination Scheme:

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

References:

1. Introduction to Computers by A. Leon and M. Leon, Vikas Publishing House.

2. Fundamentals of Computers by Rajaraman V., PHI.
3. Computers Today by Sanders D. H., McGraw Hill.
4. Computer Architecture and Organizations by J. P. Hayes, Mc Graw Hill.
5. Computer Network by Andrew S. Tanenbaum, PHI.
6. Inter Networking With TCP/IP: Principles, Protocol And Architecture by D.E.
7. The Internet For Dummies (2007) by John R. Levine, Margaret Levine Young and Carol Baroudi, 11th Edition, Willy Publishing Inc.

INTRODUCTORY BIOINFORMATICS LAB

Course Code : BIF4108 **Credit Units : 02**

Module I

Different types of search engines & important site.

Referencing in Scientific literature and their practical usage, PubMed

Biological Databases: Study of different Biological databases (esp. the ones given below), Format, their distinguishing features, Uses and Applications.

1. Sequence databases: EMBL, DDBJ, GenBank, Uniprot, PIR, TrembL
2. Domain database: Prosie, PRINT, Pfam, BLOCK
3. Cluster database/Database Technologies
4. Structure database:PDB
5. Specialised database: KEGG, PUBMED, OMIM

Module II

Sequences - protein and DNA, Multiple Sequence Alignment,

Concepts, (Clustal W, Clustal X, PILE UP), Algorithms-MSA, Progressive alignment etc, Problems with MSA method, Statistics behind MSA

Pair wise Alignment - Scoring matrices – PAM and BLOSUM series, Local and Global alignment – Algorithms, DOT matrix analysis, Heuristic alignment algorithm-BLAST & FASTA, Statistics Behind algorithms & Scores, Databases search for homologous sequence using (BLAST) and (FASTA)

Module III: Phylogenetic trees

Clustering method, Rooted and Unrooted Tree representation, Boot strapping strategies. PhyloDraw, MEGA, PHYLIP, PAUP, TreeView

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

GENETICS AND MOLECULAR BIOLOGY LAB

Course Code:BIF4109 **Credit Units: 02**

1. To make squash preparations of pre-treated metaphase chromosomes, and PMCs to view diplotene, diakinesis, metaphase I and anaphase I

2. To study through photographs normal and deviant cytogenetic mechanisms

3. Study of Mendel's laws, and deviations from Mendelian ratios using seed samples in the ratios of 9:7, 9:4:3, 13:3, 15:1, 12:3:1. Use Chi-Square Test for Testing the ratios

4. Isolation of chloroplasts by sucrose gradient. Photographs of Restriction site variation of chloroplast DNA

5. Isolation and purification of total plant and animal genomic DNA

6. Determine quality and quantity of the isolated DNA

7. Isolation of bacterial and plasmid DNA

8. Restriction digestion profile through agarose gel electrophoresis

Examination Scheme:

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

Syllabus - Second Semester

PROTEOMICS AND GENOMICS LAB

Course code:BIF4207 **Credit Units: 02**

1. Isolation of genomic DNA from any animal/plant tissue.
2. Spectro-photometric analysis of isolated DNA.
3. Extraction of proteins from microbes, plant and blood.
4. To perform PCR using the teaching kit.
5. Separation of protein and molecular weight determination using SDS-PAGE
6. Staining the gel – CBB and Silver staining
7. To perform Agarose gel Electrophoresis
8. To perform restriction enzyme digestion using the teaching kit.
9. To perform ligation using the available teaching kit

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

PROGRAMMING FOR BIOINFORMATICS LAB-I

Course code: BIF4208 **Credit Units: 02**

Course Objective: To be able to design programs using C, C++ language.

• Writing programs based on C and C++

- Finding prime numbers, Fourier series
- Reading a DNA sequence, Translating into RNA sequence
- Programs using control statements.
- Programs to implement functions
- Program to implement arrays
- Program based on structure and union
- Program to implement call by value and call by reference

Examination Scheme:

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

BIOINFORMATICS: SEQUENCE ANALYSIS LAB

Course Code: BIF4209 **CreditUnits: 01**

Course Objectives:

The course will familiarize students with the tools and principles of sequence analysis. Bioinformatics resources relevant to genome / proteome investigations will be provided for a sound working knowledge of the various technologies and approaches.

1. SequenceAnalysis Packages: EMBOSS Explorer (a web-based graphical user interface to the EM BOSS suite of bioinformatics tools)
2. NCBI ToolKit. Restriction mapping, Primer design, vector contamination in nucleic acid, Gene fi nder, Epcr, RNA analysis, Gene ontology, Sequence Submission in repository, NCBI – Entrez Human genome map viewer, OMIM – Online Mendelian Inheritance in Man, Linkage map resources: CEPH reference pedigree, CHLC – Cooperative human linkage center, Radiation hybrid map resources, Practical uses of genome maps: Locating genomic regions, Target identification, Arrangement of genes, SNP diagnosis, Positional specific cloning.
3. Conserved domain, Profile and motif comparison, EST Comparison
4. Predicting regulatory elements, Genome projects and Model Organism research -Yeast; Drosophila, C. elegans and Mouse.
5. Study of Gene expression analysis by cDNA micro arrays, SAGE
6. EST databases (DBEST, UNIGENE)
7. Protein identification and characterization tools, Primary, secondary and tertiary analysis of Protein and prediction via ExPASY tools
8. Structure visualization tools-RASMOL, SWISS-PDBVIEWER

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

Syllabus - Third Semester

COMPUTATIONAL APPROACHES TO TAZONOMY &PHYLOGENY

Course Code: BIF4304 **CreditUnits: 02**

Course Objective:
The objectives of the course are to explain the fundamental principles of chemoinformatics and issues related to drugs and the various different aspects in drug designing to development.

Course Contents:
Module-I: Introduction to Phylogenetic Analysis: trees, characters, cladistics, Parsimony: character state reconstruction, tree length and other indices, tree searching algorithms, homoplasy and weighted parsimony, Bremer support (or decay) index, consensus trees

Module-II: Sequence Alignment: gaps, gap-coding, Clustal, Distance Methods: models of nucleotide and protein evolution, UPGMA, Neighbor-Joining, Maximum Likelihood theory and methods: systematic versus random error, the long branch attraction problem and performance of phylogenetic methods, model selection and adequacy

Module-III: Bayesian Inference: MRBayes, BEAST, Hypothesis Testing: tree comparisons and statistical tests, parametric bootstrapping

Module-IV: Data heterogeneity: base and amino acid compositional biases, tests of homogeneity, total evidence versus taxonomic congruence, mixed models, Gene trees, species trees, Lineage sorting and multilocus methods, Rates and Dates: relative rates tests, calibrating the molecular clock, time dependency of evolutionary rates. Comparative Analyses: concentrated changes test, independent contrasts, ancestral state reconstruction of continuous characters

Module-V: Phylogenomics; Co-evolution, co-phylogeny: TreeMap, PHYLIP

Examination Scheme:

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

References:
1. S.C. Rastogi, Namita Mendiratta, Parag Rastogi. **Bioinformatics – Concepts, Skills, Applications".**
2. Andréa's D. Baxevanis, B.F. Francis Ouellette. **Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins.**

IPR AND BIOETHICS

Course Code:BIF4305 **CreditUnits: 02**

Course Objective:
The objectives of the course are to explain the fundamental principles of IPR and issues related to IP and examine information policy issues from different perspectives. Students will study and assess policy groups, intellectual property rights, access to information and research policy issues that usually include plant, animal and microbial genetic engineering products.

Course Contents:

Module-I: Introduction
Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property and Objectives of Intellectual Property Rights, origin and evolution of IPR, tangible and intangible property; concept and classification of intellectual property: Copyrights and related rights, Patent, Industrial Design, Trademarks and Geographical indications, Rights of traditional Knowledge and Protection of Plant varieties

Module-II: IPR
International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT) – TRIPS Agreement. Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

Module-III: Patent
Basic criterion for patentability, patentable subjects, patentable inventions, patent acquisition, infringement of patent, discovery Vs invention, product patenting Vs process patenting, special issue in biotechnology patent, Patent laws in Indian and international perspective, Patent Application procedure, patent Claim and specifications, Case study: Basmati case, Neem controversy, Turmeric Case

Module-IV: 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-V: Bioethics
Legal and socioeco'nomic impact of the products and techniques in Biotechnology, Bioethics in plant, animal and microbial genetic engineering, Ethical issues in healthcare, Biopiracy and ethical conflicts

Examination Scheme:

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

Text & References:

Text:

- Intellectual Property Rights by PaulGoldstein
- Intellectual Property Rights by K. R. G. Nair, Ashok Kumar, K. R. G. Nair
- Kilner, John, et.al, eds., *Cutting-Edge Bioethics*. Eerdmans 2002.

References:

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

SYSTEM BIOLOGY LAB

Course Code: BIF4306 **CreditUnits: 01**

Course Objective:
To give a better understanding of the basics of system biology and its applications

Course contents:

1. Software based analysis of flux balance
2. Introductory study of minimal gene complement
3. Sequence-based Prediction of Promoter Elements
4. Graphical Biological Network Editor and Simulator (Cell Designer).
5. Study of signaling pathways-properties analysis
6. Analysis based on detecting protein – protein interaction
7. Software for Protein-Protein Interaction Analysis- Yeat Two Hybrid System (Y2H);
8. Bioinformatics based analysis of Peptide Mass Fingerprinting (PMF).
9. Detailed study of KEGG
10. Study of interactions using STRING

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

PROGRAMMING FOR BIOINFORMATICS-II (JAVA) LAB

Course Code: BIF4307 **CreditUnits: 02**

Course Objective:
To evolve a detail understanding of the programming language JAVA

Course Contents:

1. Programs related to biological data to be implemented using:
2. Java Basics
3. Working with objects
4. Arrays, Conditionals and Loops
5. Creating Classes and Applications in Java
6. More about methods
7. Java Applets Basics
8. Graphics, Fonts and Color
9. Simple Animation and Threads
10. Advanced Animation, Images and Sound
11. Managing Simple Events and Interactivity
12. Creating User Interfaces with AWT
13. Windows, Networking and other Tidbits

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

MOLECULAR MODELLING & DRUG DESIGN LAB

Course Code: BIF4308 **CreditUnits: 02**

Course Objective:
This course is designed for students who wish to gain hands-on experience modeling biological molecules at the atomic level.

Course Contents:

1. Structural databases and structure analysis using - PDB and SCOPE, CATH
2. Molecular visualization tools -RasMol, Cn3D, SPDBV, Chime etc
3. Prediction of secondary structures of proteins using at least 5 different methods with analysis and interpretation of the results.
4. Comparison of the performance of the different methods for various classes of proteins.
5. Prediction of tertiary structures of proteins using Homology Modeling approach.
6. Prediction of tertiary structures of proteins using at least 3 methods for fold recognition along with analysis and interpretation of results.
7. Molecular docking by HEX

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

COMPUTATIONAL APPROACHES TO TAXONOMY PHYLOGENYLAB

Course Code: BIF4309 **CreditUnits: 02**

Course Objectives:
The course will familiarize students with the tools and principles of contemporary genomics and proteomics. Bioinformatics resources relevant to genome / proteome investigations will be provided for a sound working knowledge of current genomics and proteomics technology and approaches.

Course Contents:

1. Softwares for phylogenetic analysis: Survey of software programs available for Phylogenetic analysis.
2. MSA using ClustalW: writing files for phylogenetic analysis
3. Exploring Phylip package, its utilities and process flow. Preparing input files using Sample datasets: Numerical, binary & molecular data, Formats & format conversions.
4. Reconstruction of phylogenetic tress using molecular data (at least 2 datasets). Using bootstrapping tool to generate multiple datasets from the original input data & Generation of consensus tree.
5. Plotting, visualizing & printing phylogenetic trees
6. Phylogeny and molecular evolution – MEGA

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

GENOME ORGANIZATION AND ANALYSIS

Course Code: BIF4310 **CreditUnits: 02**

Course Objectives:
The course will familiarize students with the basics of genome organization and the different bioinformatics resources relevant to genome / proteome investigations will be used to understand the genomic organization at gene level as well as at organelle level.

Course Contents:
Module-I: Definition of Genome, Genome organization: Prokaryotic and eukaryotic, Arrangement of genes, SNP Diagnosis, C value paradox, repetitive and non-repetitive DNA, transposons and retroposons; Exons and introns, organization of interrupted genes.

Module-II: Packaging of genome – Bacterial genome as nucleoid; Eukaryotic genome – nucleosomes, chromatin, solenoids, loops, domains, scaffolds, chromosomes

Module-III: Gene numbers – essential genes and total gene number, gene clusters, pseudogenes; Gene families – globin and rDNA gene families;

Module-IV: Organelle genome – mitochondrial and chloroplast.

Module-V: Comparative Genomics- Profile Comparison, MotiF Comparison, EST Comparison, human genome Project, Annotation of Genome.

Examination Scheme:

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

References:

- Mount David W. (2001); Bioinformatics: Sequence and Genome Analysis, Cold spring Harbor Lab. NY.USA.
- Bioinformatics : A Practical Guide to analysis of Gene and Proteins. Ed. Andreas D.Barevanii and B.F. Francis Ouellette

CHEMOINFORMATICS

Course Code: BIF4311 **CreditUnits: 02**

Course Objective:
The objectives of the course are to explain the fundamental principles of chemoinformatics and issues related to drugs and the various different aspects in drug designing to development.

Course Contents:
Module-I: Introduction to cheminformatics, Evolution of cheminformatics, History of chemical information science, Use of cheminformatics, Prospectus of cheminformatics, History of medicinal chemistry.

Module-II: Prodrugs and soft drugs , Drug targets , Drug solubility, Natural resources of lead compounds, Pharmacokinetics & drug metabolism, Complexes and chelating agents

Module-III: Combinatorial chemistry and library design, virtual screening , drug likeliness and compound filters, absorption, distribution, metabolism, excretion and toxicity (ADMET) property prediction, computer based tools for drug design.

Module-IV: Development of drug, drug life cycle, drug development time lines, stages of drug discovery, strategic issues in drug discovery, emerging approaches to drug design and discovery, drug metabolism physic chemical properties, pharmacokinetic action of drug on human body, Biological testing and bioassays, Preclinical testing and clinical trial

Module-V: Concept of Patenting and Licensing of drugs

Examination Scheme:

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

NANOTECHNOLOGY

Course Code: BIF4312 **CreditUnits: 02**

Course Objective:
To develop an understanding of the concept and the applications of nanotechnology in the field of biological sciences.

Course Contents:
Module-I: Biosensors as Precursors of Bioelectronics, Functionlization of Sensing Substrates, Biochip, Nanosensors-Miniaturization of Biosensors, Nanomaterial Based Biosensors.

Module-II: Electron Transfer of Biomolecules, Nanoparticle-Biomaterial Hybrid Systems for Sensing and Electronic Devices

Module-III: DNA Templated Electronics, Sequence –specific molecular lithography, Single Biomolecule Manipulation for Bioelectronics, DNA as a semiconductor.

Module-IV: Applications of nanobiotechnology in medical diagnostics and other biomedical field.

Examination Scheme:

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

References:

- Smart Biosensor Technology, George K. Knopf, Amarjeet S. Bassi, CRC press, 2006
- Bioelectronics: From Theory to ApplicationsWillner, Itamar / Katz, Eugenii (eds.) Wiley-VCH, 2005
- Electrochemical Methods Fundamentals and Applications, 2nd Edition, by Allen J. Bard and Larry R. Faulkner
- Analytical Electrochemistry, by Joseph Wang

BIOENERGETICS

Course Code: BIF4313 **CreditUnits: 02**

Course Objectives: The course will familiarize students with the tools and principles of Bioenergy. Bioinformatics resources relevant to analyzing the bioenergy of a system will be studied for a sound understanding.

Course Contents:

Module-I: Bioenergetics-basic principles, Equilibria and concept of free energy, Coupled processes; Introduction to Glycolytic pathway, Kreb's cycle, Oxidative phosphorylation, Photosynthesis, Elucidation of metabolic pathways, Logic and integration of central metabolism, entry/ exit of various biomolecules from central pathways, Principles of metabolic regulation- Regulatory steps, Signals and second messengers.

Module-II: Free energy concepts: Free energy concept: Molecular basis of entropy, standard free energy and measurement of free energy, significance in metabolism, Application of first and second law of thermodynamics to biological systems

Module-III: Energy rich bond: ATP and interconversions of nucleotide phosphates, Phosphorylation potential, Nitrogen fixation: Biological fixation of nitrogen, symbiotic and non-symbiotic nitrogen fixation, Nitrogenase enzyme complex - azoferredoxin and molybdoferrodoxin, Physiological electron donors and mechanism of nitrogen, reduction, assimilation of ammonia, nitrogen cycle, Nif genes and its regulation.

Module-IV: Mitochondria: Architecture, chemical activity of mitochondria, Sequence of electron carriers and sites of oxidative phosphorylation, ATP generation, heme and non- heme iron Proteins, Thermodynamic considerations, oxidation – reduction electrodes, standard electrode potential, Theories of oxidative phosphorylation, uncouplers and inhibitors of energy transfer, ATP synthetase complex.

Module-V: Chloroplast: Architecture - light harvesting complexes, bacteriorhodopsin, plastocyanin, carotenoids and other pigments, Hill reaction, photo system I and II - location and mechanism of energy transfer, photophosphorylation and reduction of carbon dioxide, Calvin cycle , quantitative efficiency, photorespiration, C4 – metabolism, Chemiosmotic theory

Examination Scheme:

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

SUMMER INTERNSHIP PROJECT (EVALUATION)

Course Code: BIF4335 **CreditUnits: 06**

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 consist 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 magazine 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 idea.

6. Editing & preparing the final Paper

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

Term papers should be composed of the following sections:

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

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

Discussion

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

Conclusion

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

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

References

From the very beginning of a research project, you should be careful to note all details of articles gathered.
The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.
The key to a good bibliography is consistency. Choose a particular convention and stick to this.

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), AlltagssituationeniminterkulturellenVergleich: Realisierung von Kritik und AblehnungimDeutschen und Englischen. Unpublished MA thesis, University of Hamburg.
Walsh, R. (1995), Language development and the year abroad: A study of oral grammatical accuracy amongst adult learners of German as a foreign language. Unpublished PhD dissertation, University College Dublin.

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

Assessment Scheme:

Continuous Evaluation: (Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)	40%
Final Evaluation: (Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)	60%

Syllabus - Fourth Semester

DISSERTATION

Course Code: BIF4437 **Credit Units: 20**

GUIDELINES FOR PROJECT FILE

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

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

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

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

In general, the File should be comprehensive and include

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

Report Layout

The report should contain the following components:

- **Title or Cover Page**

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

- **Acknowledgements** (optional)

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

- **Abstract**

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

- **Table of Contents**

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

- **Introduction**

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

- **Materials and Methods**

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

- **Results and Discussion**

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

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

- **Conclusion**

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

- **Future prospects**

- **Appendices**

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

- **References / Bibliography**

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

Examples

For research article

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

For book

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

ASSESSMENT OF THE PROJECT FILE

Essentially, marking will be based on the following criteria: the quality of the report, the technical merit of the project and the project execution.
Technical merit attempts to assess the quality and depth of the intellectual efforts put into the project.
Project execution is concerned with assessing how much work has been put in.
The File should fulfill the following ***assessment objectives:***

Range of Research Methods used to obtain information

Execution of Research

Data Analysis
Analyse Quantitative/ Qualitative information
Control Quality

Draw Conclusions

Examination Scheme:

Project Report	50
Viva Voce	50
Total	**100**