Master of Science (Microbial Technology)

Programme Code: MMC

Duration – 2 Years Full Time

Programme Structure
And
Curriculum & Scheme of Examination

2009

AMITY UNIVERSITY UTTAR PRADESH
GAUTAM BUDDHA NAGAR
PREAMBLE

Amity University aims to achieve academic excellence by providing multi-faceted education to students and encourage them to reach the pinnacle of success. The University has designed a system that would provide rigorous academic programme with necessary skills to enable them to excel in their careers.

This booklet contains the Programme Structure, the Detailed Curriculum and the Scheme of Examination. The Programme Structure includes the courses (Core and Elective), arranged semester wise. The importance of each course is defined in terms of credits attached to it. The credit units attached to each course has been further defined in terms of contact hours i.e. Lecture Hours (L), Tutorial Hours (T), Practical Hours (P). Towards earning credits in terms of contact hours, 1 Lecture and 1 Tutorial per week are rated as 1 credit each and 2 Practical hours per week are rated as 1 credit. Thus, for example, an L-T-P structure of 3-0-0 will have 3 credits, 3-1-0 will have 4 credits, and 3-1-2 will have 5 credits.

The Curriculum and Scheme of Examination of each course includes the course objectives, course contents, scheme of examination and the list of text and references. The scheme of examination defines the various components of evaluation and the weightage attached to each component. The different codes used for the components of evaluation and the weightage attached to them are:

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It is hoped that it will help the students study in a planned and a structured manner and promote effective learning. Wishing you an intellectually stimulating stay at Amity University.

July, 2009
## PROGRAMME STRUCTURE

### FIRST SEMESTER

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**TOTAL** 36

**TOTAL** 35

**Abbreviations:**

A: Attendance; CT: Class Test; H: Home Assignment; S: Seminar; EE: External
Curriculum & Scheme of Examination

BACTERIOLOGY

Course Code: MMC 101 Credit Units: 03

Course Objective:
The objective of the course is to focus on the basic principles of Bacteriology, metabolism, life cycle, genetics, and importance of microbes in day-to-day life. The course also aims to impart fundamental knowledge of metabolic reactions in Bacterial cell, their growth and development and relevance to applied microbiology.

Course Contents:

Module I

Module II
Reserve food materials- polyhydroxybutyrate - polyphosphate granules - oil droplets cyanophycin granules and sulphur inclusions.

Module III

Module IV
Classification of microorganisms - Introduction - Haeckel's three kingdom concept - Whittaker's five kingdom concept - three domain concept of Carl Woese, Basis of microbial classification, Classification and salient features of bacteria according to the Bergey's manual of determinative bacteriology, cyanobacteria, prochlorons and cyanelles.

Module V: Medical Bacteriology
Early discovery of pathogenic microorganisms; development of bacteriology as scientific discipline; contributions made by eminent scientists. Classification of medically important microorganisms; Normal microbial flora of human body; role of the resident flora and the human host. Sporing and non sporing anaerobes, organisms belonging to Enterobacteriaceae, Non-fermenting Gram negative bacilli.

Examination Scheme:

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Text & References:

- Pelczar MJ, Chan ECS, Kreig NR Microbiology, Mc Graw Hill.
VIROLOGY

Course Code: MMC 102  
Credit Units: 03

Course Objective:
The aim of the course is to give a vision about the viruses, their classification, ultrastructure, importance in plants, animals and human beings. The course also gives a practical overview of the various viruses affecting living beings, their diagnostics by serology and molecular biology techniques, pathogenicity and control. The newly discovered viruses are also included in this course like SARS, Chickugonia, Birdflu etc.

Course Contents:

Module I: General Virology
Brief outline on discovery of viruses, nomenclature and classification of viruses; distinctive properties of viruses; morphology & ultrastructure; viral genome, their types and structures; virus related agents (viroids, prions).

Module II: General Methods of Diagnosis and Serology
Cultivation of viruses in embryonated eggs, experimental animals, and cell cultures; serological methods - haemagglutination; complement fixation; immunofluorescence methods, ELISA and Radioimmunoassays; assay of viruses - physical and chemical methods (protein, nucleic acid, radioactivity tracers, electron microscopy)- Infectivity assay (plaque method, end point method).

Module III: Bacterial Viruses
Bacteriophage structural organization; life cycle; brief details on M13, Mu, T3, T4, and Lambda P1.

Module IV: Plant Viruses
Classification and effects of viruses on plants; Symptomatology; common virus diseases of plants: paddy, cotton, tomato, and sugarcane; viruses of cyanobacteria, algae, fungi; life cycle; type species of plant viruses like TMV, Cauliflower mosaic virus and Potato virus x; transmission of plant viruses; diagnostics in seeds and diseased plants; prevention of crop loss due to virus infection, virus-free planting material; vector control.

Module V: Animal Viruses
Classification of animal human viruses; epidemiology, lifecycle, diagnosis, prevention and treatment of RNA Viruses Picorna, Orthomyxo, Paramyxo, Toga and other arthropod viruses, Rhabdo, Rota, HIV and other Oncogenic viruses; DNA viruses; Pox, Herpes, Adena, SV 40; Hepatitis viruses. viral vaccines (conventional vaccines, genetic recombinant vaccines, newer generation vaccines including DNA Vaccines with examples) interferons, and antiviral drugs.

Module VI
Emerging viruses: West Nile, Nijeah, SARS, Bird flu, Chickugonia

Examination Scheme:

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Text & References:
MYCOLOGY AND PHYCOLOGY

Course Code: MMC 103 Credit Units: 03

Course Objective:
Human as well plant life is highly dependent upon the microbes present in the environment. These microbes interact with the other forms of life and affect them either positively or negatively. The aim of the course is to give understanding of Algae and Fungi, their structure and function, effect on living world, economic importance etc.

Course Contents

Module I
Historical introduction to mycology structure and cell differentiation, Classification of fungi, Evolutionary tendencies in lower fungi.

Module II
A brief account of fungal cell structure, nutrition, reproduction and representative life cycles of some fungi - Synchytrium, Perenospora, Albugo, Rhizopus, Aspergillus, Penicillium, Ustilago and Puccinia; Fungi in plant diseases and its economic importance.

Module III

Module IV
Fungi and ecosystem

Module V
Distribution of algae, classification of algae, algal nutrition, algal thallus, algal reproduction, green algae, diatoms, euglenoids, brown Rhodophyta, pyrrophyta, Algal ecology and algal biotechnology, Marine algae, sea weeds and their applications;

Examination Scheme:

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Text & References:
BIOCHEMISTRY

Course Code: MMC 104 Credit Units: 03

Course Objective:
The course objective is to give a total concept of biomolecules, their presence in the living system and the functions performed by them in a living system to sustain the life on the earth. The course also defines the cellular structures and the units from which they are made up of. This study gives a better understanding of the functions of the life.

Course Contents:

Module I
Composition of living matter, biochemistry of bacterial, animal and plant cell, specialized components of microorganisms and their structure and function.

Module II
Enzymes as biocatalysts, enzyme classification, specificity, active site, activity unit, isozymes. Enzyme kinetics: Michaelis - Menten equation for simple enzymes, determination of kinetic parameters, multistep reactions and rate limiting steps, enzyme inhibition, allosterism, kinetic analysis of allosteric enzymes, principles of allosteric regulation.

Module III
Structural features and chemistry of macromolecules: nucleic acid, proteins, carbohydrates and lipids and biomolecules such as antibiotics, pigments.

Module IV: Bioenergetics and strategy of metabolism
Flow of energy through biosphere, strategy of energy production in the cell, oxidation - reduction reactions, coupled reactions and group transfer, ATP production, structural features of biomembranes, transport, free energy and spontaneity of reaction, G, G°, G’ and equilibrium, basic concepts of acids, base, pH and buffers.

Module V: Cell metabolism
Catabolic principles and break down of carbohydrates, lipids, proteins and nucleic acids, biosynthesis of macromolecules, hormone regulation of metabolism, vitamins and their role as coenzymes.

Examination Scheme:

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Text & References:
BIOSTATISTICS

Course Code: MMC 105  Credit Units: 02

Course Objective:
The course aims to develop competency and expertise in the application of statistical methods applied to biological data obtained in experimental techniques.

Course Contents:

Module I: Introduction
Definition of statistics; population and universe, the sample and population, statistical inference, parameter and statistics.

Module II
Interval Data: construction of a histogram; interpretation of histogram, normal distribution, mean, mode, median and standard deviation, representing the normal curve, uncertainties in estimation of a mean, comparison of means and variances.
Proportion data: examples of proportion data; (MPN, sterility testing of medicines, animal toxicity, therapeutic trial of drugs and vaccines, animal toxicity, infection and immunization studies) statistical treatment to proportion data. Chi-square test, test of goodness of fit
Count data: examples of count data (bacterial cell count, radioactivity count, colony and plaque counts), statistical treatment to count data; Poisson distribution, standard error, confidence limits of counts.

Module III: Analysis of variance
Introduction, procedure and tests, multiple comparisons.

Module IV
Correlation and regression and line fitting through graph points; standard curves; correlation, linear regression (fitting the best straight line through a series of points) MLR, multi-collinearity, Standard curves and interpolation of unknown Y-values.

Module V: Statistical basis of biological assays
Response-Dose metameter. Delusion Assays Direct and Indirect assays. Quantal Responses Probit, logit, LD_{50}, ED_{50}, PD_{50} - Standard line interpolation assay, parallel line assay (4 point, 6 point assays), slope ratio assay.

Examination Scheme:

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Text & References:

Course Objective:
The main objective of this course is to teach students the basic and applied aspects of microbial genetics with reference to the use of microbes in various industrial processes and basic research.

Course Contents:

Module I
Gene as unit of mutation and recombination. Molecular nature of mutations; mutagens. Spontaneous mutations - origin.

Module II

Module III

Module IV

Module V
Microbial genetics and design of vaccines. BCG and design of vaccine for TB and leprosy. DNA vaccines, design and advantages.

Examination Scheme:

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Text & References:
MICROBIOLOGY PRACTICAL - I

Course Code: MMC 120         Credit Units: 03

Course Objective:
The objective of this course is to train students practically in basic and applied principles of microbiology. The course involves demonstration and on-hand training of various microbiological techniques.

Course Contents:

Module I
Microscopy - Microscope and its operations - components - Microscope adjustments - Light sources - microscopic measurements - calibration; Types of microscope available - theory. Observation of various types of microbes under phase contrast, dark field and fluorescence.

Module II
Preparation of glassware - washing - sterilization techniques - wet heat - dry heat- filter types - laminar flow chamber types - CDC - safety levels.

Module III

Module IV
Microbial growth measurements - cell count - turbidity measurement – percentage transmission, Optical Density - serial dilution - standard plate count.

Module V
Morphological, nutritional and cultural characteristics of bacteria and identification of microbes; types of dyes - preparation - staining techniques - simple - Grams- capsule negative - flagella. spore and nuclear.

Module V: Microbial Genetics
Competent cell preparation and transformation, Replica plating techniques, UV mutagenesis

Examination Scheme:

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

Text & References:

- Handbook of Microbiological Media - Himedia.
ANALYTICAL BIOCHEMISTRY PRACTICAL

Course Code: MMC 121       Credit Units: 03

Course Objective:
The objective of this course is to train students practically in basic and applied methods of biochemistry. The course involves demonstration and on-hand training of various analytical techniques used to assay biochemical molecules in soil and living systems.

Course Contents:

Module I
Laboratory rules and safety regulations, first aid.

Module II
Principles of colorimetry: verification of Beer’s law, estimation of a selected protein, finding out Imax, relation between O.D. and percentage transmission; isolation and quantification of DNA from microorganism or other sources.

Module III
Separation of amino acids by paper chromatography.
Separation of haemoglobin and blue dextran by gel filtration.
Cell fractionation into nuclear, mitochondrial and cytoplasmic fractions; estimation of marker enzymes.

Examination Scheme:

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

Text & References:

COMMUNICATION SKILLS - I

Course Code: MMC 141        Credit Units: 01

Course Objective:
The Course is designed to give an overview of the four broad categories of English Communication thereby enhance the learners’ communicative competence.

Course Contents:

Module I: Listening Skills
Effective Listening: Principles and Barriers
Listening Comprehension on International Standards

Module II: Speaking Skills
Pronunciation and Accent
Reading excerpts from news dailies & magazines
Narrating Incident; Story telling.
Extempore & Role Plays

Module III: Reading Skills
Vocabulary: Synonyms, antonyms, diminutives, homonyms, homophones
Idioms & phrases
Foreign words in English

Module IV: Writing Skills
Writing Paragraphs
Précis Writing
Letter writing
Coherence and structure
Essay writing

Module V: Activities
News reading
Picture reading
Movie magic
Announcements

Examination Scheme:

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CAF – Communication Assessment File
GD – Group Discussion
GP – Group Presentation

Text & References:

- Working in English, Jones, Cambridge
- Business Communication, Raman – Prakash, Oxford
- Speaking Personally, Porter-Ladousse, Cambridge
- Speaking Effectively, Jermy Comfort, et.al, Cambridge
BEHAVIOURAL SCIENCE - I
(SELF-DEVELOPMENT AND INTERPERSONAL SKILLS)

Course Code: MMC 143      Credit Units: 01

Course Objective:
This course aims at imparting an understanding of:
Self and the process of self exploration
Learning strategies for development of a healthy self esteem
Importance of attitudes and their effect on work behaviour
Effective management of emotions and building interpersonal competence.

Course Contents:

Module I: Understanding Self
Formation of self concept
Dimension of Self
Components of self
Self Competency

Module II: Self-Esteem: Sense of Worth
Meaning and Nature of Self Esteem
Characteristics of High and Low Self Esteem
Importance & need of Self Esteem
Self Esteem at work
Steps to enhance Self Esteem

Module III: Emotional Intelligence: Brain Power
Introduction to EI
Difference between IQ, EQ and SQ
Relevance of EI at workplace
Self assessment, analysis and action plan

Module IV: Managing Emotions and Building Interpersonal Competence
Need and importance of Emotions
Healthy and Unhealthy expression of emotions
Anger: Conceptualization and Cycle
Developing emotional and interpersonal competence
Self assessment, analysis and action plan

Module V: Leading Through Positive Attitude
Understanding Attitudes
Formation of Attitudes
Types of Attitudes
Effects of Attitude on Behaviour
Perception
Motivation
Stress
Adjustment
Time Management
Effective Performance
Building Positive Attitude

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Text & References:
- Towers, Marc: Self Esteem, 1st Edition 1997, American Media
• Covey, R. Stephen: Seven habits of Highly Effective People, 1992 Edition, Simon & Schuster Ltd.,
• Dr. Dinkmeyer Don, Dr. Losoney Lewis, The Skills of Encouragement: St. Lucie Press.
• Singh, Dulip, 2002, Emotional Intelligence at work; First Edition, Sage Publications.
Course Objective:
To familiarize the students with the French language
• with the phonetic system
• with the syntax
• with the manners
• with the cultural aspects

Course Contents:

Module A: pp. 01 to 37: Unités 1, 2, Unité 3 Object if 1, 2
Only grammar of Unité 3: object if 3, 4 and 5

Contenu lexical: Unité 1: Découvrir la langue française: (oral et écrit)
1. se présenter, présenter quelqu’un, faire la connaissance des autres, formules de politesse, rencontres
2. dire/interroger si on comprend
3. Nommer les choses

Unité 2: Faire connaissance
1. donner/demander des informations sur une personne, premiers contacts, exprimer ses goûts et ses préférences
2. Parler de soi: parler du travail, de ses activités, de son pays, de sa ville.

Unité 3: Organiser son temps
1. dire la date et l’heure

Contenu grammatical: 1. organisation générale de la grammaire
2. article indéfini, défini, contracté
3. nom, adjectif, masculin, féminin, singulier et pluriel
4. négation avec « de », "moi aussi", "moi non plus"
5. interrogation : Inversion, est-ce que, qui, que, quoi, qu’est-ce que, où, quand, comment, quel(s), quelle(s)
   Interro-négatif : réponses : oui, si, non
6. pronom tonique/disjoint- pour insister après une préposition
7. futur proche

Examination Scheme:

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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:
• le livre à suivre : Campus: Tome 1
GERMAN - I

Course Code: MMC 145      Credit Units: 02

Course Objective:
To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Course Contents:
Module I: Introduction
Self introduction: heissen, kommen, wohnen, lernen, arbeiten, trinken, etc.
All personal pronouns in relation to the verbs taught so far.
Greetings: Guten Morgen!, Guten Tag!, Guten Abend!, Gute Nacht!, Danke sehr!, Danke!, Vielen Dank!, (es tut mir Leid!),
Hallo, wie geht’s?: Danke gut!, sehr gut!, prima!, ausgezeichnet!,
Es geht!, nicht so gut!, so la la!, miserabel!

Module II: Interviewspiel
To assimilate the vocabulary learnt so far and to apply the words and phrases in short dialogues in an interview – game for self introduction.

Module III: Phonetics
Sound system of the language with special stress on Diphthongs

Module IV: Countries, nationalities and their languages
To make the students acquainted with the most widely used country names, their nationalitie and the language spoken in that country.

Module V: Articles
The definite and indefinite articles in masculine, feminine and neuter gender. All Vegetables, Fruits, Animals, Furniture, Eatables, modes of Transport

Module VI: Professions
To acquaint the students with professions in both the genders with the help of the verb “sein”.

Module VII: Pronouns
Simple possessive pronouns, the use of my, your, etc.
The family members, family Tree with the help of the verb “to have”

Module VIII: Colours
All the color and color related vocabulary – colored, colorful, colorless, pale, light, dark, etc.

Module IX: Numbers and calculations – verb “kosten”
The counting, plural structures and simple calculation like addition, subtraction, multiplication and division to test the knowledge of numbers.
“Wie viel kostet das?”

Module X: Revision list of Question pronouns
W – Questions like who, what, where, when, which, how, how many, how much, etc.

Examination Scheme:

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CT – Project +Presentation
I – Interaction/Conversation Practice

Text & References:
- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1, 2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs
SPANISH – I

Course Code: MMC 146 Credit Units: 02

Course Objective:
To enable students acquire the relevance of the Spanish language in today’s global context, how to greet each other. How to present / introduce each other using basic verbs and vocabulary

Course Contents:

Module I
A brief history of Spain, Latin America, the language, the culture…and the relevance of Spanish language in today’s global context.
Introduction to alphabets

Module II
Introduction to ‘Saludos’ (How to greet each other. How to present / introduce each other).
Goodbyes (despedidas)
The verb llamarse and practice of it.

Module III
Concept of Gender and Number
Months of the years, days of the week, seasons. Introduction to numbers 1-100, Colors, Revision of numbers and introduction to ordinal numbers.

Module IV
Introduction to SER and ESTAR (both of which mean To Be). Revision of ‘Saludos’ and ‘Llamarse’. Some adjectives, nationalities, professions, physical/geographical location, the fact that Spanish adjectives have to agree with gender and number of their nouns. Exercises highlighting usage of Ser and Estar.

Module V
Time, demonstrative pronoun (Este/esta, Aquel/aquella etc)

Module VI
Introduction to some key AR/ER/IR ending regular verbs.

Examination Scheme:

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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

- Español, En Directo I A
- Español Sin Fronteras
Course Objective:
To enable the students to learn the basic rules of grammar and Japanese language to be used in daily life that will later help them to strengthen their language.

Course Contents:

Module I: Salutations
Self introduction, Asking and answering to small general questions

Module II: Cardinal Numbers
Numerals, Expression of time and period, Days, months

Module III: Tenses
Present Tense, Future tense

Module IV: Prepositions
Particles, possession, Forming questions

Module V: Demonstratives
Interrogatives, pronoun and adjectives

Module VI: Description
Common phrases, Adjectives to describe a person

Module VII: Schedule
Time Table, everyday routine etc.

Module VIII: Outings
Going to see a movie, party, friend’s house etc.

Learning Outcome
➢ Students can speak the basic language describing above mentioned topics

Methods of Private study /Self help
➢ Handouts, audio-aids, and self-do assignments and role-plays will support classroom teaching

Examination Scheme:

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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

Text:
• Teach yourself Japanese

References:
• Shin Nihongo no kiso 1
CHINESE – I

Course Code: MMC 148
Credit Units: 02

Course Objective:
There are many dialects spoken in China, but the language which will help you through wherever you go is Mandarin, or Putonghua, as it is called in Chinese. The most widely spoken forms of Chinese are Mandarin, Cantonese, Gan, Hakka, Min, Wu and Xiang. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

Course Contents:

Module I
Show pictures, dialogue and retell.
Getting to know each other.
Practicing chart with Initials and Finals. (CHART – The Chinese Phonetic Alphabet Called “Hanyu Pinyin” in Mandarin Chinese.)
Practicing of Tones as it is a tonal language.
Changes in 3rd tone and Neutral Tone.

Module II
Greetings
Let me Introduce
The modal particle “[ne]”.
Use of Please ‘qing” – sit, have tea …………… etc.
A brief self introduction – Ni hao ma? Zaijian!
Use of “bu” negative.

Module III
Attributives showing possession
How is your Health? Thank you
Where are you from?
A few Professions like – Engineer, Businessman, Doctor, Teacher, Worker.
Are you busy with your work?
May I know your name?

Module IV
Use of “How many” – People in your family?
Use of “[zhe]” and “[na]”.
Use of interrogative particle “[shenme]”, “[shui]”, “[ma]” and “[nar]”.
How to make interrogative sentences ending with “[ma]”.
Structural particle “[de]”.
Use of “[Nin]” when and where to use and with whom. Use of guixing.
Use of verb “[zuo]” and how to make sentences with it.

Module V
Family structure and Relations.
Use of “[you]” – “[mei you]”.
Measure words
Days and Weekdays.
Numbers.
Maps, different languages and Countries.

Examination Scheme:

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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:
- “Elementary Chinese Reader Part I” Lesson 1-10
MOLECULAR BIOLOGY

Course Code: MMC 201
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: Introduction
Introduction to molecular biology and genetics: - Historical background, nature of genetic material, experimental proof that DNA is the genetic material, different forms of DNA (A, B and Z DNA) properties of DNA, DNA denaturation and renaturation, central dogma, Special types of DNA, satellite DNA and tandem repeats.

Module II: DNA Metabolism
DNA replication: Mechanism of prokaryotic DNA replication, semiconservative model of replication, mechanisms of DNA replication, Discontinuous synthesis of DNA, DNA primer for DNA synthesis, DNA polymerases I, II and III and role of ligases and these mechanism of action and role in DNA replication. Replication of viral DNA rolling circle model; DNA repair; DNA recombination

Module III: RNA Metabolism
DNA dependent synthesis of RNA: RNA polymerase in prokaryotes, its molecular composition, role of each component of RNA polymerase, mechanism of transcription, eukaryotic transcription and eukaryotic RNA polymerases.; RNA dependent synthesis of RNA and DNA. Splicing of mRNA:Modification in RNA: 5' CAP formation, 3' end processing, polyadenylation, splicing, editing, nuclear export of mRNA and mRNA stability. Processing of other RNA’s, ribosome formation; RNA dependent synthesis of RNA and DNA

Module IV: Protein Metabolism and Gene Regulation
The genetic code; Prokaryotic and eukaryotic translation, mechanism of initiation, elongation and termination, amino acid activation, inhibitors and post translational modification of proteins. Molecular basis of eukaryotic gene regulation.

Module V: Gene silencing
Molecular mechanism of antisense molecules Biochemistry of ribozynme, hammer head, hairpin and other ribozymes. Application of antisense and ribozymes in genetic engineering.

Module VI: Genetic Engineering
Recombinant DNA technology: Basic and applied aspects, Genomics and Proteomics, DNA fingerprinting, Modern techniques: Use of RFLP, AFLP, RAPD and Satellites in mapping of genes

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Text & References:

- Genome by T.A. Brown. Publisher: John Willey & Sons Inc.
- Molecular Biology of the Cell by Alberts Bruce, Bray Demos, and Watson James D.
- Gene VIII by Benjamin Lewin 2005. Publisher : Oxford University Press
- Intoduction to Practical Molecular Biology by P.D. Dabre. Publisher: John Wiley and Sons Inc.
IMMUNOLOGY

Course Code: MMC 202  
Credit Units: 02

Course Objective:
The aim to teach immunology and immuno technology to the students for their better understanding of immune system, types and mechanism of immunity, immune responses, their tolerance and suppression as well as tools and techniques involved in diagnosis and identification of immune related diseases.

Course Contents:

Module I
History of scope of Immunology. Types of immunity - innate, acquired, passive and active physiology of immune response – MI and CMI specificity and memory. Antigen, antibody reactions. Antigens types Hapten, immunoglobulin structure, distribution and function.

Module II

Module III

Module IV
Interleukins and their roles. The complement systems mode of activation, classical and alternate pathway biological functions.

Module V
Immunoregulation-specific helper and suppressor cells, specific factors, idotype network, Immune response genes, Immunological tolerance, immunosuppression.

Module VI
Introduction to tumor immunology, autoimmune disorders and immunology of infectious diseases.

Module VII
Antigen antibody reactions in vitro methods agglutination, precipitation, complement fixation, immunofluorescence, immunoelectrophoresis, ELISA, Radio immuno assays, skin tests and immune complex tissue demonstrations.

Module VIII
Applications of these methods in diagnosis of microbial infections.

Examination Scheme:

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Text & References:

FOOD AND INDUSTRIAL MICROBIOLOGY

Course Code: MMC 203
Credit Units: 03

Course Objective:
This paper gives an applied aspect of Microbiology, which includes role of microbes in industries, various industrial processes and industrial research

Course Contents:

Module I
Food as a substrate for micro-organism, micro-organisms important in food microbiology-molds, yeasts and bacteria, brief account of each group, general characteristics and importance, principles of food preservation - asepsis - removal of microorganisms, anaerobic conditions high and low temperatures - drying - chemical preservatives - food additives.

Module II
Food spoilage and food borne infections, general principles underlying food spoilage and contamination. Technology – canning, dehydration, ultra-filtration, sterilization, irradiation in food-sugar products, vegetables, fruits, meat and meat products, milk and milk products, fish, seafood and poultry-spoilages, food poisoning-infective and toxic, bacterial and non-bacterial, general methods of their diagnosis.

Module III
General concepts of industrial microbiology, principles of exploitation of micro-organisms and their products, screening, strain development strategies, immobilisation methods, adsorption; covalent linkages - advantages and disadvantages, raw materials used in media production, industrial sterilization, fermentation equipment and its uses, types of fermentation-single, batch, continuous, dual or multiple, surface, submerged and solid state fermentation.

Module IV
Food fermentations and food produced by microbes, bread, cheese, vinegar, fermented dairy products and oriental fermented foods, microbial cells as food-single cell proteins; pickling, mushroom cultivation, production of alcohol and fermented beverages, beer and wine. Genetically manipulated crop.

Food quality & control: Analysis of food, major ingredients present in different products, microbial & chemical safety of food products

Module V
Industrial Products derived from microbes, industrial enzymes-amylase, proteinase, cellulase, aminoacid production - glutamic acid and lysine. production of antibiotics penicillins, streptomycins, vitamins - riboflavin, cyanocobalamin. Vaccines. genetic recombinant vaccines.
Enzymes for improved food production processes.
Commercial strain development
Stability of enzyme
Reaction environment

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Text & References:

MICROBIAL PHYSIOLOGY AND DEVELOPMENT

Course Code: MMC 204  Credit Units: 03

Course Objective:
The course aims to impart fundamental knowledge of metabolic reactions in microbial cell, their growth, development and its relevance to applied microbiology.

Course Contents:

Module I

Module II

Module III
Respiratory metabolism - Embden Mayer Hoff pathway - Entner Doudroff pathway - glyoxalate pathway - Krebs cycle - oxidative and substrate level phosphorylation - reverse TCA cycle gluconeogenesis - Pasteur effect; fermentation of carbohydrates - homo and heterolactic fermentations.

Module IV

Module V
Microbial development, sporulation and morphogenesis,hyphae vs yeast forms and their significance. Multicellular organization of selected microbes. Dormancy

Examination Scheme:

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Text & References:

Course Objective:
To study the microbial diversity with special reference to form structure and function of microbes, their ecological niches and their interaction with the environment. The paper also focus on the positive role of microbes in maintaining the critical environmental functions and their use in enhancing the quality of environment.

Course Contents:

Part I: Microbial Diversity

Module I: Microbial Taxonomy
Major Characteristics Used in Taxonomy, Gram-positive Cocci, Endospore forming Gram-positive rods and cocci, nonsporing gram-positive rods, Gram negative aerobic rods and cocci, Facultative anaerobic gram negative rods

Module II: Spirochetes, Archaeobacteria
Cell wall, lipids and membrane, Methanogenic and sulfate reducing archaebacteria. Cyanobacteria. Anoxygenic photosynthetic bacteria-purple bacteria, green bacteria; Oxygenic photosynthetic bacteria, Nitrogen fixers, Nitrifying/Denitrifying bacteria

Module III
Major Characteristics of Actinomycetes, Actinoplanetes, Streptomycyes; Fungi (general structure, reproduction, Nutrition and Reproduction); Algae: ultra structure of Algal cell, Nutrition, algal reproduction

Part II: Environmental Microbiology

Module IV: Aerobiology
Droplet nuclei, aerosal, assessment of air quality, - solid - liquid - impingment methods. - Brief account of air borne transmission of microbes - viruses - bacteria and fungi, their diseases and preventive measures.

Module V: Aquatic microbiology
Water ecosystems - upwelling - eutrophication - food chain. Potability of water microbial assessment of water quality - water purification - brief account of major water borne diseases and their control measures.

Module VI: Soil Microbiolog
Classification of soils - physical and chemical characteristics, microflora of various soil types (bacteria and nematodes in relevance to soil types; rhizosphere - phyllosphere) Biochemical cycles and the organisms, - carbon nitrogen - phosphorus and sulphur, biofertilizers - biological nitrogen fixation - nitrogenase enzyme - nif genes; symbiotic nitrogen fixation - (Rhizobium, Frankia) - non symbiotic microbes - Azotobacter - Azospirilium - (vesicular arbuscular mycorrhizae - VAM) - ecto, endo, ectendomycorrhizae - rumen microbiology

Module VII: Waste treatment

Module VIII: Positive and negative roles of microbes in environment
Biodegradation of recalcitrant compounds - lignin - pesticides; bioaccumulation of metals and detoxification - biopesticides; biodeterioration - of paper - leather, wood, textiles - metal corrosion - mode of deterioration organisms involved - its disadvantages - mode of prevention. GMO and their impact.

Examination Scheme:

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</table>
Text & References:

- Brock TO, Madigan MT, Biology of microorganisms. Prentice Hall Int. Inc.
- Michel. R. Introduction to environmental microbiology. 1999
- Introduction to Microbiology by Ingraham and Ingraham. Publisher: Brooks/Cole, USA. 2nd Edition
- Microbiology by Prescott, Harley and Klein. Publisher McGraw Hill, NY, USA
- Microbiology. Principles and Applications by Black. Publisher: Prentice Hall, USA
- Fundamentals of Microbiology, I. Edward Alcamo, 4th Edition
MEDICAL MICROBIOLOGY

Course Code: MMC 206
Credit Units: 04

Course Objective:
To abreast the students with basic and applied knowledge of pathogenesis and beneficiary effects of microbes used in medical systems.

Course Contents:

Module I
History of Medical Microbiology, Microscopy, Growth, growth factors, Nutrition and cultivation of microorganisms

Module II
Isolation, Identification and typing of microorganisms

Module III
Safety in Microbiology Lab, Sterilization and disinfection

Module IV: Antibiotics
History, definition, classification, mode of action, antibiotic resistance (intrinsic and acquired), side effects of antibiotics and chemotherapeutic agent, Industrial application of antibiotics & pharmaceuticals

Module V: Normal human microbiota

Module VI
Virulence and pathogenicity, Introduction to Gastrointestinal infections, Urinary track infections

Module VII
Introduction to STDs, Systemic infections, Respiratory infections, Emerging infections

Examination Scheme:

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Text & References:

- Robbins & Cotran Pathologic Basis of Disease 7th edition, Vinay Kumar, Nelso Fausto, Abul Abbas, Publisher: W.B. Saunders Company
- Medical Microbiology 3rd Edition, Cedric A. Mims (Editor), Publisher : C.V. Mosby
- Medical Microbiology & Immunology 8th Edition, Warren E. Levinson, Publisher: McGraw-Hill Medical
MOLECULAR BIOLOGY PRACTICAL

Course Code: MMC 220       Credit Units: 03

Course Objective:
Main objective of this course is to study basic molecular mechanism underlying the growth & development of microbes under different growing conditions

Course Contents:

Module I: Immunology

Module II: Molecular Biology
Plasmid DNA isolation and restriction digestion. Agarose gel electrophoresis.
Polymerase Chain Reaction (PCR)
Total soluble protein isolation, Polyacrylamide Gel Electrophoresis
Total RNA isolation & RT-PCR

Examination Scheme:

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

Texts & References:

MICROBIOLOGY PRACTICAL – II

Course Code: MMC 221
Credit Units: 03

Course Objective:
The main objective of this course is to study the growth kinetics, nutritional requirements of microbes and their structure, function analysis for environmental management.

Course Contents:

Module I: Microbial Physiology, Diversity & Environmental Microbiology practical
Demonstration of bacterial growth under aerobic, micro-aerophilic and anaerobic conditions.
Demonstration of utilization of sugars by Oxidation and fermentation techniques.
Nutrition requirements of bacteria by employing appropriate culture techniques.
Demonstration on the influence of oxygen, carbon dioxide, temperature, on the growth of bacteria.
Identification of microbes
Environmental study of water sample from different source

Module II: Medical Microbiology practical
Screening of antimicrobial agents against given microorganisms.
Microbe-microbe interaction. (Bacteria-Bacteria, Bacteria-Fungi and Fungi-bacteria) Comparison by demonstration of difference in activity and morphology of the microbes at the interface between two interacting microbes and normal microbes
To study normal flora of human body.

Examination Scheme:

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

Texts & References:

Course Objective:
To enrich the understanding of English language and communication, structure, style, usage, and vocabulary for global business purposes.

Course Contents:

Module I: Fundamentals of Communication
Role and purpose of communication: 7 C’s of communication
Barriers to effective communication
Enhancing listening
Forms of Communication: one-to-one, informal and formal

Module II: Verbal Communication (Written)
Business Letter
Social correspondence
Writing resume and Job applications

Module III: Speaking skills
Conversational English
Guidelines to give an effective presentation
Activities to include:
Presentations by students
Just a minute

Examination Scheme:

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</table>

CAF – Communication Assessment File
GD – Group Discussion
GP – Group Presentation

Text & References:

- Business Communication, Raman – Prakash, Oxford
- Textbook of Business Communication, Ramaswami S, Macmillan
- Speaking Personally, Porter-Ladousse, Cambridge
Course Objective:
This course aims at imparting an understanding of:
Process of Behavioural communication
Aspects of interpersonal communication and relationship
Management of individual differences as important dimension of IPR

Course Contents:

Module I: Behavioural Communication
Scope of Behavioural Communication
Process – Personal, Impersonal and Interpersonal Communication
Guidelines for developing Human Communication skills
Relevance of Behavioural Communication in relationship management

Module II: Managing Individual Differences in Relationships
Principles
Types of issues
Approaches
Understanding and importance of self disclosure
Guidelines for effective communication during conflicts

Module III: Communication Climate: Foundation of Interpersonal Relationships
Elements of satisfying relationships
Conforming and Disconfirming Communication
Culturally Relevant Communication
Guideline for Creating and Sustaining Healthy Climate

Module IV: Interpersonal Communication
Imperatives for Interpersonal Communication
Models – Linear, Interaction and Transaction
Patterns – Complementary, Symmetrical and Parallel
Types – Self and Other Oriented
Steps to improve Interpersonal Communication

Module V: Interpersonal Relationship Development
Relationship circle – Peer/ Colleague, Superior and Subordinate
Initiating and establishing IPR
Escalating, maintaining and terminating IPR
Direct and indirect strategies of terminating relationship
Model of ending relationship

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Text & References:
- Julia T. Wood. Interpersonal Communication everyday encounter
- Harvard Business School, Effective Communication: United States of America
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.
FRENCH - II

Course Code: MMC 244 Credit Units: 02

Course Objective:
- To enable the students to overcome the fear of speaking a foreign language and take position as a foreigner speaking French.
- To make them learn the basic rules of French Grammar.

Course Contents:

Module A: pp.38 – 47: Unité 3: Objectif 3, 4, 5, 6
Module B: pp. 47 to 75 Unité 4, 5

Contenu lexical: Unité 3: Organiser son temps
1. donner/demander des informations sur un emploi du temps, un horaire SNCF
   - Imaginer un dialogue
2. rédiger un message/ une lettre pour …
   i) prendre un rendez-vous/ accepter et confirmer/ annuler
   ii) inviter/accepter/refuser
3. Faire un programme d’activités
   - Imaginer une conversation téléphonique/un dialogue
   - Propositions- interroger, répondre

Unité 4: Découvrir son environnement
1. situer un lieu
2. s’orienter, s’informer sur un itinéraire.
3. Chercher, décrire un logement
4. connaître les rythmes de la vie

Unité 5: s’informer
1. demander/donner des informations sur un emploi du temps passé.
2. donner une explication, exprimer le doute ou la certitude.
3. découvrir les relations entre les mots
4. savoir s’informer

Contenu grammatical:
1. Adjectifs démonstratifs
2. Adjectifs possessifs/exprimer la possession à l’aide de :
   i. « de » ii. A+nom/pronom disjoint
3. Conjugaison pronominale – négative, interrogative - construction à l'infinitif
4. Impératif/exprimer l’obligation/l’interdiction à l’aide de « il faut…. »/ «il ne faut pas… »
5. passé composé
6. Questions directes/indirectes

Examination Scheme:

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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:
- le livre à suivre : Campus: Tome 1
GERMAN – II

Course Objective:
To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany
Introduction to Grammar to consolidate the language base learnt in Semester I

Course Contents:

Module I: Everything about Time and Time periods
Time and times of the day.
Weekdays, months, seasons.
Adverbs of time and time related prepositions

Module II: Irregular verbs
Introduction to irregular verbs like to be, and others, to learn the conjugations of the same, (fahren, essen, lesen, schlafen, sprechen und ähnliche).

Module III: Separable verbs
To comprehend the change in meaning that the verbs undergo when used as such
Treatment of such verbs with separable prefixes

Module IV: Reading and comprehension
Reading and deciphering railway schedules/school time table
Usage of separable verbs in the above context

Module V: Accusative case
Accusative case with the relevant articles
Introduction to 2 different kinds of sentences – Nominative and Accusative

Module VI: Accusative personal pronouns
Nominative and accusative in comparison
Emphasizing on the universal applicability of the pronouns to both persons and objects

Module VII: Accusative prepositions
Accusative propositions with their use
Both theoretical and figurative use

Module VIII: Dialogues
Dialogue reading: ‘In the market place’
‘At the Hotel’

Examination Scheme:

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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:
- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L. Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al., Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs
SPANISH – II

Course Objective:
To enable students acquire more vocabulary, grammar, Verbal Phrases to understand simple texts and start describing any person or object in Simple Present Tense.

Course Contents:

Module I
Revision of earlier modules.

Module II
Some more AR/ER/IR verbs. Introduction to root changing and irregular AR/ER/IR ending verbs

Module III
More verbal phrases (eg, Dios Mio, Que lastima etc), adverbs (bueno/malo, muy, mucho, bastante, poco). Simple texts based on grammar and vocabulary done in earlier modules.

Module IV
Possessive pronouns

Module V
Writing/speaking essays like my friend, my house, my school/institution, myself….descriptions of people, objects etc, computer/internet related vocabulary

Examination Scheme:

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C – Project + presentation
I – Interaction/Conversation Practice

Text & References:

- Español, En Directo I A
- Español Sin Fronteras
Course Code: MMC 247      Credit Units: 02

Course Objective:
To enable the students to converse in the language with the help of basic particles and be able to define the situations and people using different adjectives.

Course Contents:

Module I: Verbs
Transitive verbs, intransitive verbs

Module II: More prepositions
More particles, articles and likes and dislikes.

Module III: Terms used for instructions
No parking, no smoking etc.

Module IV: Adverbs
Different adverbial expression.

Module V: Invitations and celebrations
Giving and receiving presents,
Inviting somebody for lunch, dinner, movie and how to accept and refuse in different ways

Module VI: Comprehension’s
Short essay on Family, Friend etc.

Module VII: Conversations
Situational conversations like asking the way, at a post office, family

Module VIII: Illness
Going to the doctor, hospital etc.

Learning Outcome
➢ Students can speak the language describing above-mentioned topics.

Methods of Private study /Self help
➢ Handouts, audio-aids, and self-do assignments.
➢ Use of library, visiting and watching movies in Japan and culture center every Friday at 6pm.

Examination Scheme:

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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

Text:
➢ Teach yourself Japanese

References:
➢ Shin Nihongo no kiso 1
Course Objective:
Chinese is a tonal language where each syllable in isolation has its definite tone (flat, falling, rising and rising/falling), and same syllables with different tones mean different things. When you say, “ma” with a third tone, it mean horse and “ma” with the first tone is Mother. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

Course Contents:

Module I
Drills
Practice reading aloud
Observe Picture and answer the question.
Tone practice.
Practice using the language both by speaking and by taking notes.
Introduction of basic sentence patterns.
Measure words.
Glad to meet you.

Module II
Where do you live?
Learning different colors.
Tones of “bu”
Buying things and how much it costs?
Dialogue on change of Money.
More sentence patterns on Days and Weekdays.
How to tell time. Saying the units of time in Chinese. Learning to say useful phrases like – 8:00, 11:25, 10:30 P.M. everyday, afternoon, evening, night, morning 3:58, one hour, to begin, to end ..... etc.
Morning, Afternoon, Evening, Night.

Module III
Use of words of location like-li, wais hang, xia
Furniture – table, chair, bed, bookshelf... etc.
Description of room, house or hostel room.. eg what is placed where and how many things are there in it?
Review Lessons – Preview Lessons.
Expression ‘yao”, “xiang” and “yaoshi” (if).
Days of week, months in a year etc.
I am learning Chinese. Is Chinese difficult?

Module IV
Counting from 1-1000
Use of “chang-chang”.
Making an Inquiry – What time is it now? Where is the Post Office?
Days of the week. Months in a year.
Use of Preposition – “zai”, “gen”.
Use of interrogative pronoun – “duoshao” and “ji”.
“Whose”?? Sweater etc is it?
Different Games and going out for exercise in the morning.

Module V
The verb “qu”
Going to the library issuing a book from the library
Going to the cinema hall, buying tickets
Going to the post office, buying stamps
Going to the market to buy things.. etc
Going to the buy clothes .... Etc.
Hobby. I also like swimming.
Comprehension and answer questions based on it.
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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- “Elementary Chinese Reader Part I” Lesson 11-20
DRUG DISCOVERY AND DEVELOPMENT

Course Code: MMC 301 Credit Units: 04

Course Objective:
After taking this course you should have an understanding of the methods and strategies involved in the drug discovery and development process including:
Methods used to identify potential drug targets
Approaches to screening for lead molecules
Sources of lead molecules, including natural products, synthetic libraries, and in silico structure-based molecules
Lead optimization and
Safety issues in drug development

Course Contents:

Module I: An Introduction to Drug Discovery
General Introduction, Definition of Drug Targets, Generating Diversity, Definition of Lead Structures, Qualifying Lead for Transition to Early Trials

Module II: Clinical Drug Development
Preclinical Screening, Preclinical toxicology, Clinical Phase 1, Phase 2, Phase 3, Phase 4

Module III: Pharmacokinetics of Biotechnology Products and Large Molecules
Macromolecules, Interspecies Scaling, Pharmacokinetic Characteristics - Scientific Issues, Pharmacodynamics, Monoclonal Antibodies

Module IV: Design of Clinical Drug Development Programs
Lead identification, Lead optimization, Evaluation, Drug development, Regulatory review, Scale up and Launch, Post market

Module V: Pharmaceutical Standardization of Drugs
Essential elements of GMP, Quality, efficacy and safety of pharmaceuticals, quasi-drugs. Theory of standardization, Cosmetics and medical devices, Industry and community pharmacy practices. Role of FDA in guiding drug development

Module VI: Cutting Edge Technologies in Drug Discovery
X-ray crystallography, NMR, mass spectrometry, fluorescence spectroscopy and recombinant DNA technology.

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Text & References:

PLANT TISSUE CULTURE ENGINEERING

Course Code: MMC 302      Credit Units: 04

Course Objective:
To understand the basics of cell and tissue regeneration, their genetic modifications and industrial uses.

Course Contents:

Module I
Fundamentals of plant tissue culture, plant regeneration: organogenesis

Module II
Somatic embryogenesis; somaclonal variation, its genetic basis and application in crop improvement

Module III
Cell/callus line selection for resistance to herbicide, stress and diseases, Production of secondary metabolites by plant cell cultures

Module IV
Role of tissue culture in rapid clonal propagation, Storage of plant genetic resources, production of pathogen-free plants and "synthetic seeds"; haploid production: advantages and methods.

Module V: Protoplast technology
Isolation, culture and plant regeneration, protoplast fusion, identification and characterization of somatic hybrids, applications of protoplast technology.

Module VI
Specific gene transfers: indirect and direct methods, current status and limitations.

Module VII
Automation in plant tissue culture, Bioreactor system and models for mass cultivation of plant cells

Module VIII
Field techniques for propagation of regenerated plants, Concept of commercialization and the need

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Text & References:

- An Introduction to Plant Tissue Culture by M.K. Razdan. Publisher : Oxford and IBH Publishing
- Plant Cell & Tissue Culture for the production of Food Ingredients bt T-J Fu, G. Singh and W.R. Curtis. Publisher: Kluwer Adacemic/Plenum Press
- Plant Tissue Culture: Theory & Practice by S.S. Bhojwani and M.K. Razdan. Publisher : Elsevier Health Sciences
CLINICAL MICROBIOLOGY

Course Code: MMC 303 Credit Units: 04

Course Objective:
Aim of the course is to concentrate on principles of clinical microbiology developed through the units in basic microbiology and medical microbiology. Students will become familiar with diagnostic and public health microbiology, modern techniques for the identification of pathogens in diagnostic laboratories and antimicrobial chemotherapy in patient care.

Course Contents:

Module I
Introduction to clinical microbiology, history, scope, current status, diagnostic methods applied to clinical microbiology, host parasite interaction.

Module II
History, description mode of infection, treatment & prevention of bacterial diseases i.e Anthrax, bacterial meningitis, Cholera, Diphtheria, Leprosy (Hansen’s diseases), Pneumonia, Tuberculosis, Typhoid fever, Salmonella, Plague

Module III
History, description, mode of infection, treatment & prevention of fungal diseases. i.e. Respiratory diseases, Aspergillosis, Blastomycosis, Candidiosis, Coccidioides immitis, Cryptococcosis, Histoplasmosis, Tiniapidis

Module IV
History, description, mode of infection, treatment & prevention of Viral diseases i.e. AIDS, Hepatitis’s, Influenza, Measles & Mums, Rabies, Small pox, Poliomyelitis, Dengue fever

Module V
History, description mode of infection, treatment & prevention of i.e.Protozoans and Helminthes, Amebiasis, Ascariasis Fasiliasia, Faciolopsiased, Filariosis, Kala azar (black fever), Malaria, Taeniosis

Module VI
Systemic infection disease, Disease of upper respiratory tract, Disease of lower respiratory tract, Blood stream infection, Uro-genital tract

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Text & References:
- Biotechnological applications of microorganisms by Maheshwari
- Environmental Biotechnology by Indu Shekhar
- Industrial Biotechnology by Indu Shekhar
- Industrial hygiene and chemical safety by Fulekar
- Textbook of environmental Biotechnology by Mohapatra
BIOINFORMATICS

Course Code: MMC 304
Credit Units: 02

Course Objective:
The course aims to develop competency and expertise in the application of Bioinformatics. The paper presents an awareness and importance of information technology in both molecular biology and other aspects of bioscience.

Course Contents:

Module I
Overview of bioinformatics - Databases types.

Module II
Genomics and the genome project. Computer tools for sequence analysis: finding and retrieving sequences, similarity searching.

Module III
Pairwise and multiple alignment.

Module IV
Structure function relationships.

Module V
Sequencing and sequence assembling using computers. Phylogenetics.

Examination Scheme:

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Text & References:

- Bioinformatics 2000. Higgins & Taylor. OUP.
MICROBIOLOGY PRACTICAL – III

Course Code: MMC 320  Credit Units: 04

Course Objective:
The objective of this course is to train students practically in basic and applied principles of clinical microbiology.

Course Contents:

Module I
To find out Effect of antibiotics and fungicides on bacteria and fungi and Determination of their Minimum Inhibitory Concentration (MIC) by tube dilution and well plate method and disc diffusion method.

Module II
Biochemical tests for identification of microorganism

Module III
Isolation and characterization of clinically significant microorganisms. Case Studies. Describe several patient specimen collection and Diagnostic methods based on culture growth.

Module V

Examination Scheme:

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

Text & References:
- Mycorrhiza Manual Edited by A. Varma. Publisher: Springer, Germany
- Principles of Microbiology by Smith. Publisher: Times Mirror/Mosby College Publishing, St. Louis, Missouri, USA
PLANT TISSUE CULTURE PRACTICAL

Course Code: MMC 321      Credit Units: 02

Course Contents

Module I
Explant selection, sterilization and inoculation; various media preparations; MS, B5

Module II
Role of different hormones and their concentration in inducing shoot generation and root generation in dicot and monocot plants; Role of different temperature, osmoticum on storage of plant materials

Module III
Callus and cell suspension culture; Induction and growth parameters

Module IV
Plant regeneration from embryo, meristem and callus culture. Androgenesis: Anther and pollen culture

Module V
Collection and separation of different parts of herbs; Basic experiments (Moisture, dry weight, fibre content etc.) for the different parts; Total / Active constituents extraction; Chromatographic techniques involved. Identification techniques (NMR, IR etc.); Interpretation of spectra; Microbial Studies; Anti-microbial activities (Qualitative); Value addition of herbal extracts (Quantitative)

Module VI
Collection and separation of different parts of herbs; Extraction of active constituents of Herbs; HPLC/GLC and IR Spectroscopy; Formulations; Quality Control parameters will be studied

Module VII
Collection of dye yielding plants and extraction of dye
Extraction Profiles of dyes
Application of dyes in fabric, wool, food and other products
Analysis and properties of dyes

Module VIII
Formulation techniques of creams and powder and their toxicological trials.
Toxicological trials

Module IX
Formulation techniques of syrups and tablets, Toxicological trial

Examination Scheme:

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

Text & References:

- Experiments in Plant Tissue Culture by J.H. Dodds and L.K. Roberts. Publisher: Cambridge University Press
MYCORRHIZAL TECHNOLOGY

Course Code: MMC 305 Credit Units: 03

Course Objective:
The course will focus on application of Mycorrhizal Technology for mitigation of various environmental problems and also on enhancing crop production while preserving eco-sustainability.

Course Contents:

Module I
Rhizosphere Biology – an overview, Mycorrhizosphere concept, Significance of Rhizospheric Microbial Biodiversity
Ecology, distribution and significance of Mycorrhizal Symbiosis
Role of Rhizospheric interactions on plant performance and Fitness. Arbuscular Mycorrhizal fungi and form and functioning of Root system.
Techniques in understanding Mycorrhizal symbiosis and Microbial community structure in Mycorrhizosphere

Module II
Arbuscular Mycorrhiza Technology; Isolation of AM fungi to Mass production. Methods for mass production and maintenance
Field demonstrations for application of AM fungi as novel Biofertilizer
Industrial applications of AM fungal Technology; Phytoremediation, Organic crop production, Bioremediation, etc.

Examination Scheme:

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Text & References:

- Mycorrhiza: Structure, Function, Molecular Biology and Biotechnology. Publisher: Springer-Verlag, Germany. Editors: Varma A and Hock B
- Mycorrhiza Manual. Publisher: Springer-Verlag, Germany. Editor: Varma A
PLANT MICROBE INTERACTION

Course Code: MMC 306 Credit Units: 03

Course Objective:
The objective of the course is to appraise the students on the beneficial and harmful role of microbes in plants.

Course Contents:

Module 1
An introduction of plant microbe interaction, types of interaction (Symbiosis, parasitism, mutualism, commensalisms, saprophytism, necrotrophism etc), Plant and microbial surface organization, concept of rhizosphere, non rhizosphere, mycorhizosphere, rhizoplane and phyllosphere, Molecular basis of plant microbe interaction.

Module II
Plants and diseases, Disease development, Plant defense mechanisms, DIMBO and DIMBOA, Cultivar dependent and independent resistance, Disease forecasting, Disease control (Disease escaping, cultural, chemical, and biocontrol), Plant and nematode, Plant and insect

Module III
Bacterial plant pathogens and symbionts, Pathogen diversity, Host-pathogen interactions, Symbiotic Rhizobium-plant interactions, Genetic aspects of nitrogen fixation, concept of root, stem and leaf nodules, Plant tumors and plant transformation, Signal transduction, The natural bioengineer: Agrobacterium tumefaciens, Mechanisms of DNA transfer into host cells, Bioengineering using agrotransformation, Hypersensitivity vs pathogenicity, Host pathogen interactions regulated by Hypersensitivity/ Pathogenicity (hrp) genes, Gene interactions in virulence and avirulence, Gene interactions in plant resistance, Bacterial host recognition genes and virulence genes, Modulation of host-cell signal transduction pathways, Plant resistance R genes, Induction of R-genes by bacteria, Implications for biotechnology, quorum sensing

Module IV
Structure and function of fungi, growth and nutrition, dispersal of fungi, ecology of saprophytic fungi, fungal genetics, resistance and virulence, Plants as an environment fungus plant conformation. Effects of pathogenic fungal infusion on host plant physiology. Detailed study of physiology and structure of symbiotic fungi, host-symbiont interactions, their effects on host growth and their agricultural applications

Examination Scheme:

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Text & References:

- Microbial Activity in the Rhizosphere (Soil Biology Series), Published by Springer-Verlag, Germany, Editors: KG Mukerji, C. Manoharachary & J. Singh (2006)
- Mycorrhiza Manual, Published by Springer-Verlag, Germany, Editor: A. Varma
FERMENTATION TECHNOLOGY

Course Code: MMC 307
Credit Units: 03

Course Objective:
The objective of the course is to study the fundamental and applied aspects of Fermentation Technology.

Course Contents:

Module I
Concept-invention, economic importance of fermentation, construction & types of fermentors, media, sterilization, inoculum preparation, aeration, agitation, foam control. Fermentation process: surface, submerged, batch, and continuous fermentation. Down stream processing

Module II: Nature of enzymes
Structural and function, physiological significance of enzymes, classification and nomenclature, importance of enzymes. Rate of enzyme catalyzed reactions, rate laws and rate constants, Michaelis Menton’s hypothesis, significance and determination of Km and, Vmax, enzyme inhibition-reversible and irreversible inhibition, competitive and non competitive inhibition

Module III
Development of industrially important microbial enzymes, biochemistry and physiology. metabolism & regulation, methods of industrial production and applications of- amylases, proteinases, β galactosidase, invertases. Fermentation: beer, wine, acetic acid. Antibiotic production: Penicillin, Streptomycin.

Module IV: Immobilization
Development of immobilization techniques, specific examples of immobilized microbial enzymes useful in food systems and biotechnology, immobilized enzymes reactors. Exploitation of microbial enzymes in food systems and biotechnology, increasing yields of extra-cellular enzymes.

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Text & References:

- Immobilized Enzymes in Analytical and Clinical Chemistry by Carr and Bowers, John Willy and Sons, N.Y.
- Fundamentals of Biochemical Engineering (Volume I and II) by Ramachandran, BEC, IIT-Delhi
- Microbial Enzymes and Bioconversions. Economic Microbiology (Volume XIV) by Rose, Academic Press
Course Objective:
To understand the basis of genetic analysis in plants and microbes and their use in Recombinant DNA Technology

Course Contents:

Module I
The practice of plant genetic manipulation: Techniques of DNA manipulation, plant transformation and the analysis of the transformed plant. RNA and DNA extraction. DNA cloning, including design of inserts and use of vectors. Selection of vectors. Transformation using Agrobacterium and by particle bombardment. Introduction to reporter genes and their associated promoters. (Use of promoter gene products.). Analysis of the genome and transcriptome - radiolabelling probes, Southern analysis, Northern analysis. Reverse transcriptase (RT)-PCR and real time RT-PCR.

Module II
Gene transfer mechanisms in microbes- Transformation, transduction, conjugation and transfection. Mechanism and applications. Genetic analysis in bacteria and yeast

Examination Scheme:

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- Microbial Enzymes and Bioconversions. Economic Microbiology (Volume XIV) by Rose, Academic Press
COMMUNICATION SKILLS - III

Course Code: MMC 341      Credit Units: 01

Course Objective:
To initiate the learners with the basic mechanics of writing skills and facilitate them with the core skills required for communication in the professional world.

Course Contents:

Module I: Mechanics and Semantics of Sentences
Writing effective sentences
Style and Structure

Module II: Developing writing skills
Inter - office communication: Business Letter; E mails; Netiquette
Intra – office communication: Memos, Notices, Circulars, Minutes
Report Writing

Module III: Business Presentations
Planning, design and layout of presentation
Information Packaging
Audience analysis
Audio visual aids
Speaking with confidence
Case Studies

Examination Scheme:

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CAF – Communication Assessment File
GD – Group Discussion
GP – Group Presentation

Text & References:

- Krishnaswamy, N, Creative English for Communication, Macmillan
BEHAVIOURAL SCIENCE - III  
(LEADING THROUGH TEAMS)

Course Code: MMC 343      Credit Units: 01

Course Objective:
This course aims to enable students to:
Understand the concept and building of teams
Manage conflict and stress within team
Facilitate better team management and organizational effectiveness through universal human values.

Course Contents:

Module I: Teams: An Overview
Team Design Features: team vs. group
Effective Team Mission and Vision
Life Cycle of a Project Team
Rationale of a Team, Goal Analysis and Team Roles

Module II: Team & Sociometry
Patterns of Interaction in a Team
Sociometry: Method of studying attractions and repulsions in groups
Construction of sociogram for studying interpersonal relations in a Team

Module III: Team Building
Types and Development of Team Building
Stages of team growth
Team performance curve
Profiling your Team: Internal & External Dynamics
Team Strategies for organizational vision
Team communication

Module IV: Team Leadership & Conflict Management
Leadership styles in organizations
Self Authorized team leadership
Causes of team conflict
Conflict management strategies
Stress and Coping in teams

Module V: Global Teams and Universal Values
Management by values
Pragmatic spirituality in life and organization
Building global teams through universal human values
Learning based on project work on Scriptures like Ramayana, Mahabharata, Gita etc.

Module VI: End-of-Semester Appraisal
Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer

Text & References:

- Organizational Behaviour, Davis, K.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
FRENCH - III

Course Code: MMC 344
Credit Units: 02

Course Objective:
To provide the students with the know-how
- To master the current social communication skills in oral and in written.
- To enrich the formulations, the linguistic tools and vary the sentence construction without repetition.

Course Contents:

Module B: pp. 76 – 88 Unité 6
Module C: pp. 89 to 103 Unité 7

Contenu lexical:

Unité 6: se faire plaisir
1. acheter : exprimer ses choix, décrire un objet (forme, dimension, poids et matières) payer
2. parler de la nourriture, deux façons d’exprimer la quantité, commander un repas au restaurant
3. parler des différentes occasions de faire la fête

Unité 7: Cultiver ses relations
1. maîtriser les actes de la communication sociale courante (Salutations, présentations, invitations, remerciements)
2. annoncer un événement, exprimer un souhait, remercier, s’excuser par écrit.
3. caractériser une personne (aspect physique et caractère)

Contenu grammatical:

1. accord des adjectifs qualificatifs
2. articles partitifs
3. Négations avec de, ne…rien/personne/plus
4. Questions avec combien, quel…
5. expressions de la quantité
6. ne…plus/toujours - encore
7. pronoms compléments directs et indirects
8. accord du participe passé (auxiliaire « avoir ») avec l’objet direct
9. Impératif avec un pronom complément direct ou indirect
10. construction avec « que » - Je crois que/ Je pense que/ Je sais que

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- le livre à suivre : Campus: Tome 1
GERMAN - III

Course Code: MMC 345 Credit Units: 02

Course Objective:
To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Course Contents:

Module I: Modal verbs
Modal verbs with conjugations and usage
Imparting the finer nuances of the language

Module II: Information about Germany (ongoing)
Information about Germany in the form of presentations or “Referat”- neighbors, states and capitals, important cities and towns and characteristic features of the same, and also a few other topics related to Germany.

Module III: Dative case
Dative case, comparison with accusative case
Dative case with the relevant articles
Introduction to 3 different kinds of sentences – nominative, accusative and dative

Module IV: Dative personal pronouns
Nominative, accusative and dative pronouns in comparison

Module V: Dative prepositions
Dative preposition with their usage both theoretical and figurative use

Module VI: Dialogues
In the Restaurant,
At the Tourist Information Office,
A telephone conversation

Module VII: Directions
Names of the directions
Asking and telling the directions with the help of a roadmap

Module VIII: Conjunctions
To assimilate the knowledge of the conjunctions learnt indirectly so far

Examination Scheme:

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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L. Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs
Course Objective:
To enable students acquire knowledge of the Set/definite expressions (idiomatic expressions) in Spanish language and to handle some Spanish situations with ease.

Course Contents:

Module I
Revision of earlier semester modules
Set expressions (idiomatic expressions) with the verb Tener, Poner, Ir….
Weather

Module II
Introduction to Gustar…and all its forms. Revision of Gustar and usage of it

Module III
Translation of Spanish-English; English-Spanish. Practice sentences.
How to ask for directions (using estar)
Introduction to IR + A + INFINITIVE FORM OF A VERB

Module IV
Simple conversation with help of texts and vocabulary
En el restaurante
En el instituto
En el aeropuerto

Module V
Reflexives

Examination Scheme:

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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

- Español, En Directo I A
- Español Sin Fronteras -Nivel Elemental
Course Code: MMC 347
Credit Units: 02

Course Objective:
To enable the students to converse in the language with the help of basic verbs and to express themselves effectively and narrate their everyday short encounters. Students are also given projects on Japan and Japanese culture to widen their horizon further.
Note: The Japanese script is introduced in this semester.

Course Contents:

Module I: Verbs
Different forms of verbs: present continuos verbs etc

Module II
More Adverbs and adverbial expressions

Module III: Counters
Learning to count different shaped objects,

Module IV: Tenses
Past tense, Past continuous tense.

Module V: Comparison
Comparative and Superlative degree

Module VI: Wishes and desires
Expressing desire to buy, hold, possess. Usage in negative sentences as well.
Comparative degree, Superlative degree.

Module VII: Appointment
Over phone, formal and informal etc.

Learning Outcome
- Students can speak the language and can describe themselves and situations effectively
- They also gain great knowledge in terms of Japanese lifestyle and culture, which help them at the time of placements.

Methods of Private study /Self help
- Handouts, audio-aids, and self-do assignments.
- Use of library, visiting and watching movies in Japan and culture center every Friday at 6pm.

Examination Scheme:

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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

Text:
- Teach yourself Japanese

References:
- Shin Nihongo no kiso 1
Course Code: MMC 348       Credit Units: 02

Course Objective:
Foreign words are usually imported by translating the concept into Chinese, the emphasis is on the meaning rather than the sound. But the system runs into a problem because the underlying name of personal name is often obscure so they are almost always transcribed according to their pronunciation alone. The course aims at familiarizing the student with the basic aspects of speaking ability of Mandarin, the language of Mainland China. The course aims at training students in practical skills and nurturing them to interact with a Chinese person.

Course Contents:

Module I
Drills
Dialogue practice
Observe picture and answer the question.
Introduction of written characters.
Practice reading aloud
Practice using the language both by speaking and by taking notes.
Character writing and stroke order

Module II
Measure words
Position words e.g. inside, outside, middle, in front, behind, top, bottom, side, left, right, straight.
Directional words – beibian, xibian, nanbian, dongbian, zhongjian.
Our school and its different building locations.
What game do you like?
Difference between “hii” and “neng”, “keyi”.

Module III
Changing affirmative sentences to negative ones and vice versa
Human body parts.
Not feeling well words e.g. ; fever, cold, stomach ache, head ache.
Use of the modal particle “le”
Making a telephone call
Use of “jiu” and “cal” (Grammar portion)
Automobiles e.g. Bus, train, boat, car, bike etc.
Traveling, by train, by airplane, by bus, on the bike, by boat.. etc.

Module IV
The ordinal number “di”
“Mei” the demonstrative pronoun e.g. mei tian, mei nian etc.
use of to enter to exit
Structural particle “de” (Compliment of degree).
Going to the Park.
Description about class schedule during a week in school.
Grammar use of “li” and “cong”.
Comprehension reading followed by questions.

Module V
Persuasion–Please don’t smoke.
Please speak slowly
Praise – This pictorial is very beautiful
Opposites e.g. Clean-Dirty, Little-More, Old-New, Young-Old, Easy-Difficult, Boy-Girl, Black-White, Big-Small, Slow-Fast … etc.
Talking about studies and classmates
Use of “it doesn’t matter”
Enquiring about a student, description about study method.
Grammar: Negation of a sentence with a verbal predicate.
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C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

- “Elementary Chinese Reader Part I, Part-2” Lesson 21-30
TERM PAPER

Course Code: MMC 330            Credit Units: 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

Reference
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

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

Journal articles

Electronic book

Electronic journal articles

Other websites

Unpublished papers


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%
Course Contents:
- Forth Semester of the M.Sc. Curriculum is devoted to research dissertation work.
- Students, with the help of their mentor and faculty colleagues will identify a lab in India & abroad for the research work.
- The student should stay for a minimum prescribed Semester period at the place of work.
- Students not staying for the prescribed period will be marked absent as per the University rules
- At the end of their research the students shall submit the dissertation as per the Guidelines prescribed below.

The Aims of the Dissertation
The aim of the dissertation 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, having an educational value at a level commensurate with the award a M.Sc. Degree.

Objectives
- To provide the students an opportunity to demonstrate the ability to devise, select and use a range of methodologies appropriate to the chosen topic of research.
- To allow students to show the application of skills of data collection, critical analysis and concept synthesis necessary for formation of defensible conclusions and/or recommendations.
- To allow students the opportunity to demonstrate ability to draw appropriate conclusions argued from the evidence presented. [Should the research produce negative or inconclusive results, the conclusions should be critically examined to ascertain the reasons].
- To provide a forum to demonstrate the skills of structuring and present a balanced informed, complete, clear and concise written argument.

Dissertation Guidelines

The Dissertation Topic
It is important to distinguish here between ‘dissertation topic’ and ‘dissertation title’. The topic is the specific area that you wish to investigate. The title may not be decided until the dissertation has been written so as to reflect its content properly.

Few restrictions are placed on the choice of the topic. Normally the topic is expected to be:
- relevant to Microbial Sciences;
- related to one or more of the subjects or areas of study within the core program and specialisation stream;
- clearly focused so as to facilitate an in-depth approach, subject to the availability of adequate sources of information and to the knowledge of students;
- of value and interest to the students and their personal and professional development.

Dissertation format
All students must follow the following rules in submitting their dissertation.
- Front page should provide title, name of the student, name of degree and the date of submission.
- Second page should contain the certificate received from the organization/University from where the student has completed his/her project work.
- The next page should be the table of contents giving page references for each chapter and section.
- The next page should be the table of graphs, figures and tables giving legends and page numbers.
- Next to follow should be following in the sequence given below:
  - Abbreviations used (if any)
  - Introduction
  - State-of-Art
  - Material & Methods
  - Results
  - Discussion
  - Summary (approximately 500 words)
  - Conclusion
  - Future Prospects
- References: After this concluding chapter, students should give a list of all the references they have used. These should be cross - references with the text. For articles from journals, the following details are required e.g.

**For books, the following details are required**

**For book chapter**

- Finally, you should give any appendices. These should only include relevant statistical data or material that cannot be fitted into the above categories.
- List of Publications (if any) by the students should be attached in the end.

**Guidelines for the assessment of the dissertation**

While evaluating the dissertation, faculty guide will consider the following aspects:

1. Has the student made a clear statement of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information / data suitable to the frameworks?
6. Are the materials & methods employed by the student to analyse the data / information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?

**Examination Scheme:**

<table>
<thead>
<tr>
<th>Components</th>
<th>Theme of Dissertation</th>
<th>Quality of Dissertation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage (%)</td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>
SEMINAR

Course Code: MMC 456      Credit Units: 10

Course Contents:
Student shall defend the project by delivering a Seminar, which will be attended by the students and faculty members of Amity University Uttar Pradesh.

The Aims of the Seminar
The aim of the seminar is to provide you with an opportunity to further your intellectual and personal development in your chosen field by undertaking a significant practical unit of activity, having an educational value at a level commensurate with the award M.Sc. (Microbial Technology).

Objectives
- To provide the students an opportunity to demonstrate the ability to devise, select and use a range of methodologies appropriate to the chosen topic of research.
- To allow students to show the application of skills of data collection, critical analysis and concept synthesis necessary for formation of defensible conclusions and/or recommendations.
- To allow students the opportunity to demonstrate ability to draw appropriate conclusions argued from the evidence presented. [Should the research produce negative or inconclusive results, the conclusions should be critically examined to ascertain the reasons].
- To provide a forum to demonstrate the skills of structuring and present a balanced informed, complete, clear and concise written argument.

Guidelines for the Assessment of the Seminar
While evaluating the dissertation, faculty guide will consider the following aspects:
1. Has the student made a clear presentation of the objective or objective(s).
2. If there is more than one objective, do these constitute parts of a whole?
3. Has the student developed an appropriate analytical framework for addressing the problem at hand.
4. Is this based on up-to-date developments in the topic area?
5. Has the student collected information/data suitable to the frameworks?
6. Are the material & methods employed by the student to analyse the data/information appropriate and relevant?
7. Has the student succeeded in drawing conclusion form the analysis?
8. Do the conclusions relate well to the objectives of the project?

Examination Scheme:
The seminar shall be evaluated by the examination committee appointed by the Director General, AIMT / Amity University Uttar Pradesh.

<table>
<thead>
<tr>
<th>Components</th>
<th>Art of Presentation</th>
<th>Quality of Presentation</th>
<th>Discussion</th>
<th>Literature Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage (%)</td>
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