B.Tech. + M.Tech. Biotechnology (Dual Degree)

Programme Code: UMT

Duration – 5 Years Full Time

Programme Structure
And
Curriculum & Scheme of Examination
2010

AMITY UNIVERSITY UTTAR PRADESH
GAUTAM BUDDHA NAGAR
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, 2010
PROGRAMME OBJECTIVE

The major focus of the dual degree program is in bridging bio-sciences and bio-engineering and to integrate the knowledge base of undergraduate and postgraduate programmes. Multiple paths have been embedded in the design of the curriculum. The main objective is to create a flexible educational experience comprising biosciences credentials like Microbiology and Immunology, Biochemistry, Molecular Biology & Genetic engineering, Plant and Animal cell & Tissue culture, Genomics and Proteomics, IPR and bioengineering like Bioprocess Technology, Down stream processing, Unit operations along with the momentous chemical engineering credentials, mathematics and basic engineering subjects along with latest specialized courses like Nanobiotechnology, Microarray Technology, Metabolic engineering etc. The highlight of the syllabus is to make the students gain the practical knowledge through training, projects and hands on experience to latest techniques.
# PROGRAMME STRUCTURE

## FIRST SEMESTER

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## TERM PAPER (DURING SUMMER BREAK)

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**FOURTH SEMESTER**

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**SUMMER PROJECT – I OF 6-8 WEEKS OF 9 CREDIT UNITS**

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**EIGHTH SEMESTER**

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**SUMMER PROJECT – III OF 6-8 WEEKS OF 9 CREDIT UNITS**

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Curriculum & Scheme of Examination

APPLIED MATHEMATICS – I

Course Code: UMT 101      Credit Units: 04

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and
Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from
Mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:

Module I: Differential Calculus
Derivative of a function, Derivatives at a point, Fundamental rules for differentiation: Product Rule, Quotient
Rule and Chain Rule, Differentiation of Implicit Functions, Parametric forms and Logarithmic Differentiation,
Successive differentiation, Leibnitz’s theorem (without proof), Mean value theorem, Taylor’s and Maclaurin’s
Theorem, Asymptote & Curvature, Partial Differentiation, Euler’s Theorem, Maxima and Minima

Module II: Integral Calculus
Fundamental Integral Formulae, Methods of Integration: Integration by Substitution, By Parts, Partial Fractions,
Definite Integral and its Properties, Reduction Formulae, Application to length, Area and Volume.

Module III: Ordinary Differential Equations
Definition of Order and Degree of differential equation, Formation of ODEs, Solution of Differential Equation
of 1st Order and 1st Degree: Variable Separation, Homogeneous Differential Equations, Linear Differential
Equations, Exact Differential Equations, General Linear ODE of Second Order, Solution of Homogeneous
Equation, Solution of Simple Simultaneous ODE

Examination Scheme:

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Text & References:

Text:
- Differential Calculus by Shanti Narain
- Integral Calculus by Shanti Narain

References:
- Differential Equation by A.R.Forsyth
- Higher Engineering Mathematics by H.K. Dass
APPLIED PHYSICS – I

Course Code: UMT 102  Credit Units: 03

Course Objective:
Aim of the course is to introduce the students to fundamentals of graduate level physics which forms the basis of all the applied sciences and engineering.

Course Contents:

Module I: Oscillations & Waves

Module II: Electrostatics
Intensity and flux of an electric field, Gauss’ theorem and its application, Differential form, Electrostatic potential, Equipotential surfaces, Gradient of a scalar potential, Curl of a vector field, Stoke’s theorem, Dielectrics, Polarization, Polarization and Displacement vector, Equation of continuity.

Module III: Magnetostatics
Magnetic effects of current, Ampere’s law, Biot-Savart law, Faraday’s laws of electromagnetic induction, Motion of charged particles in electric and magnetic fields, Energy gained in E&M fields, Hall effect, Cyclotron.

Module IV: Electromagnetic Theory
Maxwell’s equations, Physical significance, Displacement current, Poynting vector, Electromagnetic wave propagation in dielectric and conducting media.

Module V: Wave nature of light
Temporal and Spatial coherence, Review of interference of light, Newton’s rings, Multiple beam interferometry, Fabry-Perot interferometer, Fresnel diffraction, Half period zones, Zone plate, Fraunhoffer diffraction at single slit and double slit, Transmission grating and its resolving power, Polarization, Birefringence, Nicol prism, Distinction between plane, circularly and elliptically polarized light, Half wave and quarter wave plate, Optical rotation, Specific rotation, Polarimeter, Laurent’s half Shade device.

Examination Scheme:

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Text & References:

Text:
- E.M. Purcell, “Waves and Oscillations” Berkeley Physics Course, Vol. II (Ed. 2)
- D. V. Chopra “Waves and Oscillations”

References:
- N. K. Bajaj “Waves and Oscillations”
- P. French Waves & Oscillations”
- Electromagnetism, Jordan
- Introduction to Electrodynamics, D. J. Griffith
- Principles of Optics, B. K. Mathur and T. P. Pandey
- W. C. Elmore and M.A. Heald, “Physics of Waves”
- A. Ghatak “Optics”
- D. P. Khandelwal “Optics and Atomic Physics,”
Course Objective:
Four basic sciences, Physics, Chemistry, Mathematics and Biology are the building blocks in engineering and technology. Chemistry is essential to develop analytical capabilities of students, so that they can characterize, transform and use materials in engineering and apply knowledge in their field. All engineering fields have unique bonds with chemistry whether it is Aerospace, Mechanical, Environmental and other fields the makeup of substances is always a key factor, which must be known. For electronics and computer science engineering, apart from the material, computer modeling and simulation knowledge can be inherited from the molecule designing. The upcoming field of technology like Nanotechnology and Biotechnology depends fully on the knowledge of basic chemistry. With this versatile need in view, course has been designed in such a way so that the student should get an overview of the whole subject starting from the very basic bonding mechanism to the application of materials.

Course Contents:

Module I: Chemical Bonding
Types of bond: Ionic, Covalent and Co-ordinate bond; Fajan’s rule; Hybridisation; H- bonding; Valence bond and Molecular orbital theory for diatomic molecule.

Module II: Organic Mechanism
Electronegativity and dipole moment; Electron Displacement Effects: Inductive Effect; Mesomeric Effect; Electromeric Effects; Fission of covalent bonds; Intermediates of Organic reactions; Carbonium , Carbanion, Free Radical and Carbene; Types of organic reactions; Substitution, Elimination, Addition.

Module III: Instrumental method for Analysis
Introduction; Principles of spectroscopy; Law’s of Absorbance; IR: Principle Instrumentation; Application; UV: Principle, Instrumentation and Application; NMR Principle and Instrumentation; Application; Chromatography; GC: Principle, Instrumentation and Application; HPLC: Principle, Instrumentation and Application.

Module IV: Thermodynamics
Introduction; Terminology; First Law; Heat Capacity; Calculation of thermodynamic quantities; Adiabatic and Isothermal Process; Reversible and Irreversible Process; Second law of Thermodynamics; Standard State; Gilbb’s Helmholtz equation; VantHoff Isotherm and Isochore; Maxwell Relation; Third law of Thermodynamics; Chemical Potential; Activity and Activity Coefficient; Coupled Reactions.

Module V: Chemical Equilibrium
Introduction; Le Chatelier’s Principle; Equilibrium constant from Thermodynamic Constants; Acid-Base Concept; Weak acid and Weak base and their salts; Solubility Product; pH and pOH, Buffer Solution, Buffer Action.

Examination Scheme:

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Text & References:

Text:
- Engineering Chemistry, Jain & Jain
- Engineering Chemistry, Shashi Chawla

References:
- Organic Mechanism, Morrison and Boyd
- Physical Chemistry, Puri Sharma and Pathania
- Organic Chemistry Vol-I – IL Finar
- Organic Chemistry Vol-II – IL Finar
- Physical Chemistry, Atkins Peter, Paula Julio
- A guide to mechanism in organic chemistry, Peter Sykes.
- Introduction to practical chemistry, K.K. Sharma
- Concise Inorganic chemistry, J.D. Lee
ENVIRONMENT STUDIES

Course Code: UMT 104  Credit Units: 04

Course Objective:
The term environment is used to describe, in the aggregate, all the external forces, influences and conditions, which affect the life, nature, behaviour and the growth, development and maturity of living organisms. At present a great number of environment issues, have grown in size and complexity day by day, threatening the survival of mankind on earth. A study of environmental studies is quite essential in all types of environmental sciences, environmental engineering and industrial management. The objective of environmental studies is to enlighten the masses about the importance of the protection and conservation of our environment and control of human activities which has an adverse effect on the environment.

Course Contents:

Module I: The multidisciplinary nature of environmental studies
Definition, scope and importance
Need for public awareness

Module II: Natural Resources
Renewable and non-renewable resources:
Natural resources and associated problems
Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
Role of an individual in conservation of natural resources.
Equitable use of resources for sustainable lifestyles.

Module III: Ecosystems
Concept of an ecosystem
Structure and function of an ecosystem
Producers, consumers and decomposers
Energy flow in the ecosystem
Ecological succession
Food chains, food webs and ecological pyramids
Introduction, types, characteristic features, structure and function of the following ecosystem:
   a. Forest ecosystem
   b. Grassland ecosystem
   c. Desert ecosystem
   d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Module IV: Biodiversity and its conservation
Introduction – Definition: genetic, species and ecosystem diversity
Biogeographical classification of India
Value of biodiversity: consumptive use, productive use, social, ethical aesthetic and option values
Biodiversity at global, national and local levels
India as a mega-diversity nation
Hot-spots of biodiversity
Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
Endangered and endemic species of India
Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

Module V: Environmental Pollution
Definition
Causes, effects and control measures of:
a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear pollution


Module VI: Social Issues and the Environment
From unsustainable to sustainable development
Urban problems and related to energy
Water conservation, rain water harvesting, watershed management
Resettlement and rehabilitation of people; its problems and concerns. Case studies.
Environmental ethics: Issues and possible solutions
Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
Wasteland reclamation
Consumerism and waste products
Environmental Protection Act
Air (Prevention and Control of Pollution) Act
Water (Prevention and control of Pollution) Act
Wildlife Protection Act
Forest Conservation Act
Issues involved in enforcement of environmental legislation
Public awareness

Module VII: Human Population and the Environment
Population growth, variation among nations
Population explosion – Family Welfare Programmes
Environment and human health
Human Rights
Value Education
HIV / AIDS
Women and Child Welfare
Role of Information Technology in Environment and Human Health
Case Studies

Module VIII: Field Work
Visit to a local area to document environmental assets-river / forest/ grassland/ hill/ mountain.
Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
Study of common plants, insects, birds
Study of simple ecosystems-pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

Examination Scheme:

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Text & References:

- Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380 013, India, Email: mapin@icenet.net (R)
- Clark R.S., Marine Pollution, Clauderson Press Oxford (TB)
- De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- Down to Earth, Centre for Science and Environment (R)
- Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
• Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
• Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
• Survey of the Environment, The Hindu (M)
• Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science
• Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II, Enviro Media (R)
• Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
INTRODUCTION TO COMPUTERS

Course Code: UMT 105 Credit Units: 02

Course Objective:
The objective in this course module is to acquaint the students with the basics of computers and its architecture. It also includes coverage of the basic language i.e. C.

Course Contents:

Module I: Introduction

Module II: Introduction to Programming

Module III: Programming using C
Example of some simple C program. Dissection of the program line by line. Concept of variables, program statements and function calls from the library (Printf for example) C data types, int, char, float etc.C expressions, arithmetic operation, relational and logic operations. C assignment statements, extension of assignment to the operations. C primitive input output using getchar and putchar, exposure to the scanf and printf functions.

Module IV: Fundamental Features in C
C Statements, conditional executing using if, else. Optionally switch and break statements may be mentioned. Concepts of loops, example of loops in C using for, while and do-while. Optionally continue may be mentioned. One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations. Concept of Sub-programming, functions. Example of functions. Argument passing mainly for the simple variables.

Module V: Advanced features in C

Examination Scheme:

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Text & References:

Text:

References:
LIFE SCIENCE

Course Code: UMT 106      Credit Units: 03

Course Objective:
The objective of the course is to provide students an understanding of the very basic molecules of life-
DNA, RNA, proteins and how these molecules, when form further complex molecules like carbohydrates,
vitamins and lipids, then functioning of body takes place. Since technology is advancing in every field,
emphasize is also given on the understanding of application of some biotechnological concepts used in our daily
life like biofuels, biofertilizers. An introduction to the origin of earth, the environment-air, water and land,
origin of life on Earth, how life evolved from a single cell, some environmental problems and measures to be
taken to combat them.

Course Contents:

Module I: Cell Biology
Organization of cell (Inorganic-Water and Ions; Organic-Proteins, Lipids and Carbohydrates constituents)
Physical structure of the cell-Brief introduction to the Cell Membrane, Cytoplasm and its Organelles (Nucleus,
Mitochondria, Golgi, Endoplasmic Reticulum, Lysosomes, Peroxisomes, Ribosomes, Chloroplasts), Cell cycle.

Module II: Introduction to Cell Physiology
Transport of substances through the cell membrane- Osmosis, Diffusion and its types, Active transport (Sodium-
potassium pump) and Passive transport, Membrane potential, Measuring Membrane Potential, Action Potential

Module III: Environmental Biotechnology
Biosensors, Biochips and Biofilms, GMO’s and Biofertilizers
Biofuels
Gene Therapy, Stem cell and Nanobiomolecules
Bio Informatics- Introduction and Applications

Module IV: Ecology & Environment
Ecosystem- Structure and functions, Food chain, Food web, Energy flow, Ecological pyramids
Energy sources- Conventional (Coal, Petrol, Natural gas) and Non-conventional (Solar, Wind, Geothermal,
Hydro and Biomass)
Pollution- Air, Water, Land, Thermal and Nuclear
Conferences and Protocols- Stockholm, Montreal, Rio-de-Janerio, Kyoto
Environmental issues- Green House Effect, Global Warming and Warning, El-Nino, Acid Rain,
Sustainable Development, Environmental Disasters (Earthquake, Floods, Drought and Cyclones)

Examination Scheme:

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</tbody>
</table>

Text & References:

Text:
• Fundamentals of Environmental Chemistry, G.S.Sodhi, Narosa Publishers
• Introduction to Environmental Pollution, B.K Sharma, H.Kaur, Goel Publishers.

References:
• For Biochemistry, Styrier, Lalinger
• For Cell Biology, C B Pawar
APPLIED PHYSICS LAB - I

Course Code: UMT 120
Credit Units: 01

Course Contents:

1. Wavelength of sodium light using Newton’s rings.
2. Dispersive power of material of prism.
3. Specific rotation of sugar by polarimeter.
4. Temperature coefficient of platinum wire of Platinum resistance thermometer using Callender and Griffith Bridge.
5. e/m of electron by Thomson’s method
6. Variation of T with l for a bar pendulum – value of g.
7. Resistance and specific resistance of a given wire - Carey Foster’s bridge.
8. Velocity of ultrasonic waves in a given liquid (kerosene oil)
10. Variation of magnetic field along the axis of a circular coil carrying current by using Stewart & Gee’s tangent galvanometer – radius of the coil.
11. Planck’s constant and photoelectric work function of the material of the cathode using a photoelectric cell.

Examination Scheme:

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<td>Major Experiment</td>
<td>Minor Experiment/Spotting</td>
<td>Practical Record</td>
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Note: Minor variation could be there depending on the examiner
APPLIED CHEMISTRY LAB - I

Course Code: UMT 121
Credit Units: 01

Course Contents:

1. To prepare and describe a titration curve for phosphoric acid and sodium hydroxide titration using pH meter.
2. To verify Beer’s law and apply it to find the concentration of the given unknown solution.
3. To determine the concentration of iron in the given sample of water by spectroscopic method (colorimetric method) using KCNS as color developing agent.
4. a) To find the cell constant of conductivity cell.
   b) To determine the strength of hydrochloric solution by titrating it against standard sodium hydroxide solution conductometrically.
5. To determine the heat of neutralization of acetic acid and NaOH and heat of Ionization.
6. To determine the heat of neutralization of HCl and NaOH and heat of Ionization.
7. To determine the number of water molecules of crystallization in Mohr’s salt, provided standard potassium dichromate solution (0.1) using diphenyl amine as internal indicator.
8. To determine the surface tension of a liquid by drop number method.
9. To determine the composition of a liquid mixture A and B (acetic acid and water) by surface tension method.
10. To determine of Equilibrium constant by applying distribution law the following reaction \( \text{KI} + \text{I}_2 = \text{KI}_3 \)
11. To determine the ferrous content in the supplied sample of iron ore by titrimetric analysis against standard \( \text{K}_2\text{Cr}_2\text{O}_7 \) solution by using potassium ferrocyanide as an external indicator.
12. To separate a mixture of dyes using thin layer chromatography.

Examination Scheme:

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Note: Minor variation could be there depending on the examiner
PROGRAMMING IN C LAB

Course Code: UMT 122
Credit Units: 01

Software Required: Turbo C/C++

Course Contents:

1. DOS commands
2. Creation of batch files
3. C program involving problems like finding the nth value of cosine series, Fibonacci series. Etc.
4. C programs including user defined function calls
5. C programs involving pointers, and solving various problems with the help of those.
6. File handling

Examination Scheme:

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

Course Objective:
The course is intended to give a foundation of English Language. The literary texts are indented to help students to inculcate creative & aesthetic sensitivity and critical faculty through comprehension, appreciation and analysis of the prescribed literary texts. It will also help them to respond form different perspectives.

Course Contents:

Module I: Vocabulary
Use of Dictionary
Use of Words: Diminutives, Homonyms & Homophones

Module II: Essentials of Grammar - I
Articles
Parts of Speech
Tenses

Module III: Essentials of Grammar - II
Sentence Structure
Subject -Verb agreement
Punctuation

Module IV: Communication
The process and importance
Principles & benefits of Effective Communication

Module V: Spoken English Communication
Speech Drills
Pronunciation and accent
Stress and Intonation

Module VI: Communication Skills-I
Developing listening skills
Developing speaking skills

Module VII: Communication Skills-II
Developing Reading Skills
Developing writing Skills

Module VIII: Written English communication
Progression of Thoughts/ideas
Structure of Paragraph
Structure of Essays

Module IX: Short Stories
Of Studies, by Francis Bacon
Dream Children, by Charles Lamb
The Necklace, by Guy de Maupassant
A Shadow, by R.K.Narayan
Glory at Twilight, Bhabani Bhattacharya

Module X: Poems
All the Worlds a Stage Shakespeare
To Autumn Keats
O! Captain, My Captain. Walt Whitman
Where the Mind is Without Fear Rabindranath Tagore
Psalm of Life H.W. Longfellow

Examination Scheme:

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</table>
Text & References:

- Madhulika Jha, Echoes, Orient Longman
- Successful Communications, Malra Treece (Allyn and Bacon)
- Effective Technical Communication, M. Ashraf Rizvi, Tata MacGrawhill

* 30 hrs Programme to be continued for Full year
Course Objective:
This course aims at imparting:
Understanding self & process of self exploration
Learning strategies for development of a healthy self esteem
Importance of attitudes and its effective on personality
Building Emotional Competence

Course Contents:

Module I: Self: Core Competency
Understanding of Self
Components of Self – Self identity
Self concept
Self confidence
Self image

Module II: Techniques of Self Awareness
Exploration through Johari Window
Mapping the key characteristics of self
Framing a charter for self
Stages – self awareness, self acceptance and self realization

Module III: Self Esteem & Effectiveness
Meaning and Importance
Components of self esteem
High and low self esteem
Measuring your self esteem

Module IV: Building Positive Attitude
Meaning and nature of attitude
Components and Types of attitude
Importance and relevance of attitude

Module V: Building Emotional Competence
Emotional Intelligence – Meaning, components, Importance and Relevance
Positive and Negative emotions
Healthy and Unhealthy expression of emotions

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.
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
Course Code: UMT 144 Credit Units: 02

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 Objectif 1,2
Only grammar of Unité 3: objectif 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: UMT 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 Dipthongs.

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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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 – I

Course Code: UMT 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: UMT 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.

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- “Elementary Chinese Reader Part I” Lesson 1-10
APPLIED MATHEMATICS – II

Course Code: UMT 201       Credit Units: 04

Course Objective:
The knowledge of Mathematics is necessary for a better understanding of almost all the Engineering and Science subjects. Here our intention is to make the students acquainted with the concept of basic topics from mathematics, which they need to pursue their Engineering degree in different disciplines.

Course Contents:

Module I: Linear Algebra

Module II: Complex Number
Definition of Complex Number, Equality, Conjugate and Modulus of a Complex Number, Polar form of a Complex Number, De-Moivre’s Theorem, Roots of a Complex Number, Exponential and Circular function of a Complex Number, Hyperbolic Functions and their inverses.

Module III: Vector Calculus
Scalar and vector field, Gradient, Divergence and Curl, Directional Derivative, Evaluation of a Line Integral, Green’s theorem in plain (without proof), Stoke’s theorem (without proof) and Gauss Divergence theorem (without proof).

Module IV: Probability and Statistics

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Text & References:
- Higher Engineering Mathematics by H.K. Dass
Course Objective
Aim of the course is to introduce the students to fundamentals of graduate level physics which forms the basis of all the applied sciences and engineering.

Course Contents:

Module I: Relativity
Inertial and Non Inertial frame, Michelson – Morley Experiment, Special theory of relativity, Relativistic space-time transformation, Transformation of velocity and mass, Mass-energy equivalence.

Module II: Wave Mechanics
de Broglie matter waves, Davisson and Germer experiment, Heisenberg uncertainty principle, Phase and Group velocity, Wave packets, Expectation values, Physical interpretation of wave functions, Ehrenfest’s theorem, Operators, Time dependent and time-independent Schrodinger equation for free and bound states, square-well potential (rigid walls, potential step)

Module III: Atomic Structure
Atom models, Energy levels, Effect of magnetic and electric field- Zeeman, Paschen Bach and Stark effect.
Lasers: Einstein’s Coefficients, Population inversion, types of lasers and applications
X-rays: Production and measurement, Energy level diagram, Absorption and Diffraction, Bragg’s law

Module IV: Radioactivity and Nuclear Physics

Module V: Superconductivity
Zero resistance, perfect diamagnetism – Messiner effect, Superconductivity at High TC, Type I and Type II super conductors, Direct and Indirect band gap superconductors, Cooper pairs, Elements of BCS theory.

Module IV: Nanoscience & Nanotechnology
Synthesis, Characterization and application of nanomaterials – solar cells, photocatalysis, conducting glass plates.

Examination Scheme:

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Text & References:

Text:
- Physics of the atom, Wehr and Richards
- Solid state physics, Kittel

References:
- Nuclear Physics, Halliday
- Nuclear Physics, Y.R. Waghmare
- Elementary solid state physics, M Ali Omar
- Solid state physics, H.C. Gupta
- Solid state physics, Dekkar
- Modern Physics, Sehgal and Chopra
- Atomic and Nuclear Physics, C.L. Arora
- Fundamentals of modern Physics, R. M. Eisberg
- Lasers and nonlinear Optics, Laud
- Nanotechnology, Mark Ratner & Daniel Ratner
APPLIED CHEMISTRY - II

Course Code: UMT 203  Credit Units: 03

Course Objective:
Four basic sciences, Physics, Chemistry, Mathematics and Biology are the building blocks in engineering and technology. Chemistry is essential to develop analytical capabilities of students, so that they can characterize, transform and use materials in engineering and apply knowledge in their field. All engineering fields have unique bonds with chemistry whether it is Aerospace, Mechanical, Environmental and other fields the makeup of substances is always a key factor, which must be known. For electronics and computer science engineering, apart from the material, computer modeling and simulation knowledge can be inherited from the molecule designing. The upcoming field of technology like Nanotechnology and Biotechnology depends fully on the knowledge of basic chemistry. With this versatile need in view, course has been designed in such a way so that the student should get an overview of the whole subject starting from the very basic bonding mechanism to the application of materials.

Course Contents:

Module I: Water
Hardness of Water; Boiler Feed Water; Scale and Sludge; Softening of Water; External and Internal Treatment of Boiler Water; Domestic Water Treatment; Domestic Water Treatment; Desalination of Brackish Water; Chemical Analysis of Water; Dissolved O₂ (BOD, COD); Estimation of Free Chlorine; TDS.

Module II: Lubricants
Introduction; Mechanism of Lubrication; Types of Lubricants; Chemical structure related to Lubrication; Properties of lubricants; Viscosity and Viscosity Index; Iodine Value; Aniline Point; Emulsion number; Flash Point; Fire Point; Drop Point; Cloud Point; Pour Point. Selection of Lubricants.

Module III: Fuel
Introduction; Characteristics of good Fuel ; Calorific value; Bomb Calorimeter; Proximate and Ultimate analysis of coal; Carbonization of coal; Gasification and Liquification of coal: Fischer Tropsch and Bergius Process; Water Gas and Producer Gas

Module IV: Polymers
Introduction; Polymerization: Addition and Condensation Polymerization; Thermosetting and Thermoplastic Polymers; Molecular Weight of Polymer; Rubber, Plastic and Fiber; Preparation, Properties and uses of PMMA, Polyester, Epoxy Resins and Bakelite, Silicone Polymers.

Module V: Corrosion

Examination Scheme:

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Text & References:

Text:
- Engineering Chemistry, Jain & Jain
- Engineering Chemistry, Shashi Chawla

References:
- Engineering Chemistry, Dara
- Engineering Chemistry, Sunita Ratan
- Polymer Science, Gowariker, Viswanathan Sreedhar
- Corrosion Engineering, Fontenna and Greene
OBJECT ORIENTED PROGRAMMING IN C++

Course Code:   UMT 204      Credit Units: 03

Course Objective:
The objective is to introduce about object oriented programming as a different approach of programming. The various features of object oriented programming like Inheritance; polymorphism etc. is explored through C++. Importance is given on the programming skills which includes the techniques of object oriented programming. Student should be able to find it different from procedural programming and get the importance of creation of objects in programs.

Course Contents:

Module I: Introduction

Module II: Classes and Objects
Abstract data types, Object & classes, attributes, methods, C++ class declaration, State identity and behavior of an object, Constructors and destructors, instantiation of objects, Default parameter value, Copy Constructor, Static Class Data, Constant and Classes, C++ garbage collection, dynamic memory allocation.

Module III: Inheritance and Polymorphism
Inheritance, Types of Inheritance, Class hierarchy, derivation – public, private & protected, Aggregation, composition vs classification hierarchies, Polymorphism, Type of Polymorphism – Compile time and runtime, Method polymorphism, Polymorphism by parameter, Operator overloading, Parametric polymorphism, Generic function – template function, function name overloading, Overriding inheritance methods.

Module IV: Files and Exception Handling

Module V: AutoCAD
Use of Drawing & Editing Properties: Modify Object Properties and a know how of layers, colors and prototype drawing. Draw line (Poly line, multi line, linear line), polygon, ellipse, circle, arc, rectangle and use cross hatching, regions, boundary, spline, donut, fillet and extent command Dimensioning commands, styles, control scale factors, drawing set-up, grip editing objects snaps, utility command Projection of points, lines and solids, Section of Solid Development and Intersection of Surface Isomeric Projections

Examination Scheme:

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Text & References:

Text:

References:
ELECTRICAL SCIENCE

Course Code: UMT 205
Credit Units: 02

Course Objective:
The objective of the course is to provide a brief knowledge of Electrical Engineering to students of all disciplines. This Course includes some theorems related to electrical, some law’s related to flow of current, voltages, basic knowledge of Transformer, basic knowledge of electromagnetism, basic knowledge of electrical network.

Course Contents:

Module I: Electrical Quantities

Module II: Network Analysis Techniques

Module III: Alternating Current Circuits
Peak, Average and RMS values for alternating currents, Power calculation: reactive power, active power, Complex power, power factor, impedance, reactance, conductance, susceptance Resonance: series Resonance, parallel resonance, basic definition of Q factor & Band-width.

Module IV: Network Theorems
Superposition theorem, Thevenin’s Theorem, Norton’s theorem and Reciprocity theorem.

Module V: Electromagnetism
Magnetic Induction: Faraday’s law, Lenz’s law, Hysteresis, magnetic Circuits, Excitation of magnetic circuits, Energy stored in magnetic circuits

Module VI: Transformers
Transformer Operation: Construction, Voltage relations, Exciting current, current relations, Linear circuit models, Transformer as two port network, open circuit test, short circuit test, Transformer performance : Efficiency and voltage regulation.

Examination Scheme:

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Text & References:

Text:
- R.J. Smith, R.C. Dorf: Circuits, devices and Systems
- B.L. Thareja: Electrical Technology : Part -1 & 2

References:
- V.Deltoro: Electrical Engineering fundamentals
- Schaum’s Series: Electrical Circuits
Course Contents:

1. Frequency of an electrically maintained tuning fork by Melde’s experiment.
2. Variation of magnetic field along the axis of Helmholtz coil.
3. Intensity distribution of diffraction pattern of a single slit, double slit and circular aperture by He-Ne laser.
4. ‘G’ by Kater’s reversible pendulum.
5. Plateau characteristics of a G. M. Counter using radioactive source.
6. Co-efficient of thermal conductivity of a bad conductor by Lee’s method.
7. Charging and discharging of a capacitor by CRO.
8. Waveform and frequency of a.c. using CRO – Lissajous figures.
9. Hall coefficient and number of charge carrier per unit volume for n – type semiconductor.
10. Rydberg’s constant with the help of diffraction grating and constant deviation spectrograph.
11. $\gamma$, $\eta$ & $\sigma$ of the material of given wire by Searl’s apparatus.

Examination Scheme:

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Note: Minor variation could be there depending on the examiner.
APPLIED CHEMISTRY LAB - II

Course Code: UMT 221      Credit Units: 02

Course Contents:

1. To determine the viscosity index of a lubricating oil by using Redwood viscometer.
2. To determine the Flash point and Fire point of a lubricating oil by Pensky and Martin Apparatus.
3. To do proximate analysis of coal.
4. To determine total hardness, permanent and temporary harness of water.
5. To determine the alkalinity of water.
6. To determine residual chlorine in water.
7. To synthesize the urea formaldehyde resin and find the total yield.
8. To determine the Molecular weight of Polystyrene by viscometric method.
10. To determine the dissolved Oxygen in water.
11. To determine the Iodine value of a lubricating oil.

Examination Scheme:

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Note: Minor variation could be there depending on the examiner.
OBJECT ORIENTED PROGRAMMING IN C++ LAB

Course Code: UMT 222  Credit Units: 01

Software Required: Turbo C++ and AUTOCAD 2001

Course Contents:

1. Creation of objects in programs and solving problems through them.
2. Different use of private, public member variables and functions and friend functions.
3. Use of constructors and destructors.
4. Operator overloading.
5. Use of inheritance in and accessing objects of different derived classes.
6. Polymorphism and virtual functions (using pointers).
7. File handling.
8. Different type 2D and 3D problems.

Examination Scheme:

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Note: Minor variation could be there depending on the examiner
Course Code: UMT 223
Credit Units: 01

List of Experiments:
1. To verify KVL & KCL in the given network.
2. To verify Superposition Theorem.
3. To verify Maximum Power Transfer Theorem.
4. To verify Reciprocity Theorem.
5. To verify Thevenin’s Theorem.
6. To verify Norton’s Theorem.
7. To perform OC & SC Test on I phase transformer.
8. Transient response of RLC Ckt.

Examination Scheme:

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Note: Minor variation could be there depending on the examiner
Course Objective:
The course is intended to give a foundation of English Language. The literary texts are intended to help students to inculcate creative & aesthetic sensitivity and critical faculty through comprehension, appreciation and analysis of the prescribed literary texts. It will also help them to respond from different perspectives.

Course Contents:

Module I: Vocabulary
Use of Dictionary
Use of Words: Diminutives, Homonyms & Homophones

Module II: Essentials of Grammar - I
Articles
Parts of Speech
Tenses

Module III: Essentials of Grammar - II
Sentence Structure
Subject -Verb agreement
Punctuation

Module IV: Communication
The process and importance
Principles & benefits of Effective Communication

Module V: Spoken English Communication
Speech Drills
Pronunciation and accent
Stress and Intonation

Module VI: Communication Skills-I
Developing listening skills
Developing speaking skills

Module VII: Communication Skills-II
Developing Reading Skills
Developing writing Skills

Module VIII: Written English Communication
Progression of Thoughts/ideas
Structure of Paragraph
Structure of Essays

Module IX: Short Stories
Of Studies, by Francis Bacon
Dream Children, by Charles Lamb
The Necklace, by Guy de Maupassant
A Shadow, by R.K.Narayan
Glory at Twilight, Bhabani Bhattacharya

Module X: Poems
All the Worlds a Stage Shakespeare
To Autumn Keats
O! Captain, My Captain. Walt Whitman
Where the Mind is Without Fear Rabindranath Tagore
Psalm of Life H.W. Longfellow

Examination Scheme:

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Text & References:

- Madhulika Jha, Echoes, Orient Longman
- Successful Communications, Malra Treece (Allyn and Bacon)
- Effective Technical Communication, M. Ashraf Rizvi, Tata MacGrawhill
BEHAVIOURAL SCIENCE - II
(PROBLEM SOLVING AND CREATIVE THINKING)

Course Code: UMT 243      Credit Units: 01

Course Objective:
To enable the students:
Understand the process of problem solving and creative thinking.
Facilitation and enhancement of skills required for decision-making.

Course Contents:

Module I: Thinking as a tool for Problem Solving
What is thinking: The Mind/Brain/ Behaviour
Critical Thinking and Learning:
Making Predictions and Reasoning
Memory and Critical Thinking
Emotions and Critical Thinking
Thinking skills

Module II: Hindrances to Problem Solving Process
Perception
Expression
Emotion
Intellect
Work environment

Module III: Problem Solving
Recognizing and Defining a problem
Analyzing the problem (potential causes)
Developing possible alternatives
Evaluating Solutions
Resolution of problem
Implementation
Barriers to problem solving:
  - Perception
  - Expression
  - Emotion
  - Intellect
  - Work environment

Module IV: Plan of Action
Construction of POA
Monitoring
Reviewing and analyzing the outcome

Module V: Creative Thinking
Definition and meaning of creativity
The nature of creative thinking
  - Convergent and Divergent thinking
  - Idea generation and evaluation (Brain Storming)
  - Image generation and evaluation
  - Debating
The six-phase model of Creative Thinking: ICEDIP model

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:
- Michael Steven: How to be a better problem solver, Kogan Page, New Delhi, 1999
- Geoff Petty: How to be better at creativity; Kogan Page, New Delhi, 1999
• Phil Lowe Koge Page: Creativity and Problem Solving, New Delhi, 1996
• J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 3, Management (1996); Pfeiffer & Company
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

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- le livre à suivre : Campus: Tome 1
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 prepositions 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 Dallapianza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs
SPANISH – II

Course Code: UMT 246
Credit Units: 02

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.

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Español, En Directo I A
- Español Sin Fronteras
JAPANESE - II

Course Code: UMT 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”.
“What”?? 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
Course Objective:
Cell biology plays a central role to connect the different fields of biotechnology which is highly interdisciplinary. It incorporates elements of biology, maths, physics and chemistry with combination of computers and electronics. The object of the present course is to understand the structure and function of the cellular and sub cellular components of cells and tissues with the help of recent techniques.

Course Contents:

Module I
The cell theory, pre cellular evolution, prokaryotic and eukaryotic cells.

Module II
Cell cycle - molecular events, cell division, mitosis and meiosis.

Module III
Cellular organelles - structure and function of cell wall, plasma membrane nucleus, Mitochondria, Chloroplast, Nucleus, lysosomes, peroxisomes, golgi bodies, and transport across membranes.

Module IV
Cell locomotion - cytoskeleton, structure and function of cilia and flagella.

Module V
Cellular signaling – general mechanism of signaling and structures of the various types of receptors.

Module VI
Types of cancer, etiology of cancer, metastasis, cytological role of p53 and p21 genes in cancer development.

Module VII
Apoptosis

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Text & References:

Text:
- Cell and Molecular Biology, Gerald Karp, John Wiley and Sons Inc.
- Cell and Molecular Biology, DeRobertis, B.I. Publication Pvt. Ltd.

References:
- Cell in Development and Inheritance, E.B. Wilson, Macmilian.
- Developmental Biology, S.F. Gilbert, Sinauer Associates Inc.
Course Objective:
The course aims on understanding of the relationships between structure and function in the major classes of biopolymers. It augurs understanding on central metabolic process and the role of enzymes in modulating pathways. The theoretical background of biochemical systems helps to interpret the results of laboratory experiments.

Course Contents:

Module I
Introduction aims and scope
Chemical foundations of Biology - Properties of water, acids, bases and buffers, covalent bonds, Non-covalent interactions in biological systems.

Module II
Introduction to biomolecules - Carbohydrates -Sugars; Polysaccharides
Lipids -classification, structure and function. Lipids and biological membranes, Lipid linked proteins and lipoproteins.

Module III
Metabolism and bioenergetics - First and second law, free energy and chemical equilibrium, Organic reaction mechanisms, Design of metabolism -concept of free energy, ATP-ADP cycle. Cellular energy transactions -role of mitochondria and chloroplast

Module IV
Carbohydrate metabolism - glycolysis pathway and reactions, Glycogen breakdown and synthesis, control of glycogen metabolism, glycogen storage and its diseases, Citric acid cycle -Overview, Metabolic sources of Acetyl Co-A, enzymes and regulation, The amphibolic nature of the Citric acid cycle Electron transport chain and oxidative photophosphorylation -mitochondrion and electron transport, phosphorylation and control of ATP production Gluconeogenesis, The glyoxylate pathway, Pentose phosphate pathway

Module V
Lipid metabolism -Lipid digestion, absorption and transport, fatty acid oxidation, ketone bodies, fatty acid biosynthesis, regulation of fatty acid metabolism. Cholesterol and Arachidonic Acid metabolism, Phospholipids, Sphingolipids and Glycolipids

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</table>

Text & References:

Text:
- Biochemistry, L. Stryer, W.H. Freeman and Company

References:
- Tools of Biochemistry, T.G. Cooper, John Wiley and Sons Inc.
- Biochemical calculations, I.H. Segal. Publisher, John Wiley and Sons
- Devlin’s Textbook of Biochemistry with Clinical correlations, John Wiley and Sons Inc.
MICROBIOLOGY

Course Code: UMT 303 Credit Units: 04

Course Objective:
The course imparts the knowledge of different types of microorganisms that are invisible to our naked eyes. Discovery origin and evaluation of different forms of bacteria, fungi, protozoa and viruses constitute the basics of biotechnology.

Course Contents:

Module I
Introduction and historical perspective-Discovery of the microbial world, controversy over spontaneous generation, role of microorganisms in transformation of organic matter and in the causation of diseases, development of pure culture methods. Methods in Microbiology -Principles of microbial nutrition, Culture media, Theory and practice of sterilization, pure culture techniques

Module II
Prokaryotic structure and function - functional anatomy of bacteria: cell envelope, cell wall, cytoplasmic membrane, capsule, surface appendages, cytoplasm and cytoplasmic inclusions. Growth -The definition of growth, mathematical expression of growth, growth curve, measurement of growth, synchronous growth, continuous culture, culture collection and maintenance of cultures.

Module III
Systematics and taxonomy - new approaches to bacterial taxonomy, classification including ribotyping, ribosomal RNA sequencing, characteristics of primary domains, taxonomy, nomenclature and Bergey's manual.

Module IV
Metabolic Diversity among microorganisms- photosynthesis in microorganisms, role of bacteriochlorophylls, carotenoids and phycobilins, Chemolithotrophy, hydrogen-iron-nitrite-oxidizing bacteria, nitrate and sulphate reduction, methanogenesis and acetogenesis, Fermentations, nitrogen fixation, plant microbe interactions (mycorrhizae).

Module V
Archaea: Archae as earliest life forms, thermophiles, psychrophiles, halophiles, alkalophiles, acidophiles, hyperthermophiles Viruses: Bacterial, animal; structure of viruses; Reproduction and life cycle of RNA and DNA viruses; Viroids and prions.

Module VI
Host-parasite relationship -Normal micro flora of skin, oral cavity, gastrointestinal tract, Respiratory infections; entry of pathogens into the host, types of toxins (Exo, endo, entro) and their mode of actions, Microbial pathogenesis - Disease reservoirs; Epidemiological terminologies; Infectious disease transmission; Sexually transmitted disease including AIDS, Food and water borne diseases; pathogenic fungi.

Module VII
Chemotherapy/antibiotics - Antimicrobial agents, sulfa drugs, antibiotics -penicillin and cephalosporins, broad spectrum antibiotics, antifungal antibiotics; mode of action

Examination Scheme:

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Text & References:

Text:
- General Microbiology, R.Y. Stanier, J.L. Ingraham, M.L.Wheelis and P.R. Painter, Macmillian

References:
- Microbiology by Prescott
- The microbes – An Introduction to their Nature and Importance, P.V. Vandenmark and B.L. Batzing, Benjamin Cummings.
• The Microbial World, Roger Y. Stanier, Prentice Hall
• Microbiology, Tortora, Funke and Chase, Benjamin & Cummings
• Principles of Fermentation Technology, Salisbury, Whitaker and Hall, Aditya Books Pvt. Ltd.
• Industrial Microbiology, Casida, New Age International
• Industrial Microbiology, Prescott and Dunn, C.B.S. Publishers Principles of Microbiology, R.M. Atlas, Wm C. Brown Publisher.
Course Objective:
The aim of the present course is to enable the students to acquire and demonstrate competence in information
technology and information skills so that they can use word processor to produce well formatted and organized
documents as well as spread sheets to produce numeric models and graphical representation of data.

Course Contents:

Module I
Introduction to computer science -Overview and history of computing; Data storage; Data manipulation;
Operating systems and networks.

Module II
Introduction to number of systems: binary, Octal, Hexadecimal;

Module III
Introduction to C and C++, Control structures, Data files, Functions, Arrays

Module IV
Introduction to object oriented programming.

Examination Scheme:

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Text & References:

Text:
• A book on C by Kelley : Programming in C, Addison-Wesley Publishing
• Computer Science, J.G. Brookshear, Pearson, Addison Wesley

References:
• Introduction to C++ for Engineers and Scientists, Prentice-Hall
• Schaum’s Outline of Introduction of Computer Science, P. Cushman and R. Mata-Toledo, McGraw Hill Trade
• The Practice of Programming, B.W. Kernighan and R. Pike, Addison-Wesley Publishing Company
BASIC BIOANALYTICAL TECHNIQUES

Course Code: UMT 305      Credit Units: 04

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

Course Contents:

Module I: Solution and Buffers
Preparation of solutions, concept of pH and buffer, types of buffers and their preparation, pH meter.

Module II: Centrifugation
Principle of centrifugation, rotors, different types of centrifuges, preparative and analytical centrifugation, ultra centrifugation.

Module III: Microscopy
Optical microscopy, Bright field, Dark field, phase contrast and fluorescence microscopy.

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

Module V
Cell Disruption techniques, ultra filtration, dialysis and reverse osmosis.

Examination Scheme:

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Text & References:

Text:
- Principles of Physical Biochemistry, K.E. Van Holde, Prentice Hall.
- Essentials of Biophysics, P. Narayanan, New Age International Publishers

References:
- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press
- Crystallography made Crystal Clear, G. Rhodes, Academic Press
- Modern Spectroscopy, J.M. Hollas, John Wiley and Son Ltd.
- NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry, H. Gunther, John Wiley and Sons Ltd.
CELL BIOLOGY LAB

Course Code: UMT 320
Credit Units: 01

Course Contents:

Module I: Microscopy
Bright field, phase contrast and fluorescence microscopy.

Module II
Study of cell organelles

Module III
Study of chromoplasts, chloroplasts in various plant cells.

Module IV: Cell division
Mitosis and Meiosis

Module V
Study of permanent slides of types of cancer

Examination Scheme:

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Note: Minor variation could be there depending on the examiner
BIOCHEMISTRY LAB - I

Course Code: UMT 321        Credit Units: 02

Course Contents:

Module I
Colorimetric determination of pK.

Module II
Colour reactions of sugars. (Molischs test, iodine test, Saliwanoff test, Fehlings test, Benedicts test, Bials test).

Module III
Cholestrol estimation
Estimation of free fatty acids
Estimation of iodine number.

Examination Scheme:

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Course Contents:

1. Preparation of solid and liquid media.
2. Isolation and maintenance of organisms by plating, streaking and serial dilution.
3. Preparation of slant cultures.
4. Growth curve measurement of bacterial population by turbidometry.
7. Microscopic examination of bacteria by gram staining.
8. Endospore staining.
9. Capsule staining.
10. Isolation and identification of Rhizobium from root nodules.

Examination Scheme:

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# BASICS OF COMPUTER SYSTEMS AND PROGRAMMING LAB

**Course Code:** UMT 322  
**Credit Units:** 01

## Course Contents:

**Module I**  
Simple programs for matrix addition, multiplication, transposition, string searching, binary conversion.

**Module II**  
Programming for control structures—use of control structures in relevant mathematical problems.

**Module III**  
Memory reallocation—programming to interchange the values of certain integers.

**Module IV**  
Creation of classes of objects and to use that class to regenerate another class.

**Module V**  
Inheritance and polymorphism—Creation of abstract classes.

## Examination Scheme:

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TERM PAPER - I

Course Code: UMT 330 Credit Units: 03

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 magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes
Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.
a) Get facts, not just opinions. Compare the facts with author's conclusion.
b) In research studies, notice the methods and procedures, results & conclusions.
c) Check cross references.

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

5. Writing the first draft
Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:
a) statement of purpose
b) main body of the paper
c) statement of summary and conclusion
Avoid short, bumpy sentences and long straggling sentences with more than one main 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
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

Bibliography

From the very beginning of a research project, you should be careful to note all details of articles gathered. The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

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

Bibliographical conventions

Monographs

Edited volumes
[(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
Unpublished theses/ dissertations

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

Assessment Scheme:

**Continuous Evaluation:** 40%
(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

**Final Evaluation:** 60%
(Based on the organization of the paper, objectives/problem profile/issue outlining, comprehensiveness of the research, flow of the idea/ideas, relevance of material used/presented, outcomes vs. objectives, presentation/viva etc.)
COMMUNICATION SKILLS - I

Course Code: UMT 341      Credit Units: 01

Course Objective:
To form written communication strategies necessary in the workplace.

Course Contents:

Module I: Introduction to Writing Skills
Effective Writing Skills
Avoiding Common Errors
Paragraph Writing
Note Taking
Writing Assignments

Module II: Letter Writing
Types
Formats

Module III
Memo
Agenda and Minutes
Notice and Circulars

Module IV: Report Writing
Purpose and Scope of a Report
Fundamental Principles of Report Writing
Project Report Writing
Summer Internship Reports

Examination Scheme:

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<th>Components</th>
<th>CT1</th>
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</table>

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

Text & References:

- Creative English for Communication, Krishnaswamy N, Macmillan.
- Working in English, Jones, Cambridge.
- Effective Writing, Withrow, Cambridge.
- Writing Skills, Coe/Rycroft/Ernest, Cambridge.
- Welcome!, Jones, Cambridge.
Course Objective:
This course provides practical guidance on
Enhancing personal effectiveness and performance through effective interpersonal communication
Enhancing their conflict management and negotiation skills.

Course Contents:

Module I: Interpersonal Communication: An Introduction
Importance of Interpersonal Communication
Types – Self and Other Oriented
Rapport Building – NLP, Communication Mode
Steps to improve Interpersonal Communication.

Module II: Behavioural Communication
Meaning and Nature of behavioural communication
Persuasion, Influence, Listening and Questioning
Guidelines for developing Human Communication skills
Relevance of Behavioural Communication for personal and professional development.

Module III: Interpersonal Styles
Transactional Analysis
Life Position/Script Analysis
Games Analysis
Interact ional and Transactional Styles.

Module IV: Conflict Management
Meaning and nature of conflicts
Styles and techniques of conflict management
Conflict management and interpersonal communication.

Module V: Negotiation Skills
Meaning and Negotiation approaches (Traditional and Contemporary)
Process and strategies of negotiations
Negotiation and interpersonal communication.

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
- Foster John, Effective Writing Skills: Volume-7, First Edition 2000, Institute of Public Relations (IPR)
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.
Course Objective:
To provide the students with the know-how
- To master the current social communication skills in oral and 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
Course Code: UMT 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 Dallapienza et al, Tangram Aktuell A1/1,2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs
Course Code: UMT 346      Credit Units: 02

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.
JAPANESE - III

Course Code: UMT 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 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”
“My” 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.
Examination Scheme:

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<tr>
<th>Components</th>
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C – Project + Presentation  
I – Interaction/Conversation Practice

Text & References:

BIOCHEMISTRY - II

Course Code: UMT 401  Credit Units: 04

Course Objective:
The course aims on understanding of the relationships between structure and function in the major classes of biopolymers. It augurs understanding on central metabolic process and the role of enzymes in modulating pathways. The theoretical background of biochemical systems helps to interpret the results of laboratory experiments.

Course Contents:

Module I
Proteins - Amino acids and peptides - classification, chemical reactions and physical properties. Introduction to protein structure and function. Glycoproteins - structure and function, Vitamins and Coenzymes. Enzymes - Introduction to kinetic and catalytic mechanisms of enzymes; Regulation of enzyme activity; Effects of physical parameters on enzyme activity.

Module II
Nucleic acids - nitrogenous bases, nucleotides, types, structure and properties of nucleic acids

Module III
Amino acid metabolism - Amino acid deamination, urea cycle, amino acids as biosynthetic precursors, biosynthesis of amino acids, Specialized Products of Amino Acids, Nitrogen fixation.

Module IV
Nucleotide Metabolism - structure and metabolism of purines and pyrimidines, biosynthesis of nucleotide coenzymes; Heme and Porphyrin Metabolism.

Examination Scheme:

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Text & References:

Text:

References:
- Tools of Biochemistry, T.G. Cooper, John Wiley and Sons Inc.
- Biochemical calculations, I.H. Segal. Publisher, John Wiley and Sons.
- Devlin’s Textbook of Biochemistry with Clinical correlations, John Wiley and Sons Inc.
Course Objective:
The objective of the course is to focus on the basic principles of genetics incorporating the concepts of classical, molecular and population genetics. Compilation is required for recent advances in genetic principles for strong foundation in Biotechnology.

Course Contents:

Module I
The science of genetics - introduction, history, classical and molecular genetics, role of genetics in medicine, agriculture and society.

Module II: Mendelism

Module III
Molecular mapping of the genome - genetic and physical maps, physical mapping and map based cloning, choice of mapping population, simple sequence repeat loci, Southern and fluorescence in situ hybridization for genome analysis; RFLP, RAPD and AFLP analysis, molecular markers linked to disease resistance genes; Applications of RFLP in forensic, disease prognosis, genetic counseling, pedigree, varietal etc. Animal trafficking and poaching, germplasm maintenance, taxonomy and biodiversity.

Module IV
Mutation and mutagenic agents, types of mutations, economic importance of mutation

Module V
Concept of gene – classical and modern, pseudoallelism, position effect, intragenic crossing over & complementation (cistron, recon & nutron) Benzer’s work on r II locus in T2 bacteriophage

Module VI: Nuclear Inheritance in Higher Plants
Overview of the mitochondrial and chloroplast Genome with suitable examples.

Module VII: Genetics of Population
Hardy-Weinburg Law and its deviations.

Examination Scheme:

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Text & References:

Text:
- Genetics, P.K. Gupta, Rastogi Publication
- Concepts of Genetics (Sixth Edition), William S. Klug and Michael R, Cummings, Pearson Education

References:
- Genetics, M.W. Strickberger, Prentice Hall College Division
- Genetics, P.J. Russell, Benjamin/Cummings
- Principles of Genetics, E J Gardner, John Wiley & Sons Inc.
- Genetics, R. Goodenough, International Thomson Publishing
- Introduction to Genetic Analysis, A.J. F. Griffiths, W.H. Freeman and Company
- Principles of Genetics, D.P. Snustad & M.J. Simmons, John Wiley and Sons Inc.
Course Objective:
The students will be exposed to techniques and instruments that are used in biotech industries.

Course Contents:

Module I: Electrophoresis
Gel electrophoresis, SDS-PAGE, isoelectric focusing, two-dimensional electrophoresis, immunoelectrophoresis, capillary electrophoresis

Module II: Chromatography
Paper, TLC, gel filtration, ion-exchange chromatography, affinity chromatography, HPLC and GLC

Module III: Spectroscopy
UV and visible spectroscopy, Infrared and Atomic absorption spectroscopy, fluorescence spectroscopy, Mass Spectrometry, MALDITOF, Nuclear Magnetic Resonance and Electron Spin Resonance spectroscopy,

Module IV
X-ray diffraction and X-ray Crystallography

Examination Scheme:

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Text & References:

Text:
- Principles of Physical Biochemistry, K.E. Van Holde, Prentice Hall.
- Essentials of Biophysics, P. Narayanan, New Age International Publishers

References:
- Advanced Instrumentation, Data Interpretation, and Control of Biotechnological Processes, J.F. Van Impe, Kluwer Academic
- Crystal Structure Analysis, J.P. Glusker and K.N. Trueblood, Oxford University Press
- Crystallography made Crystal Clear, G. Rhodes, Academic Press
- Modern Spectroscopy, J.M. Hollas, John Wiley and Sons Ltd.
- NMR Spectroscopy: Basic Principles, Concepts and Applications in Chemistry, H. Gunther, John Wiley and Sons Ltd.
DATA STRUCTURE AND ALGORITHMS

Course Code: UMT 404  Credit Units: 04

Course Objective:
It helps the students to utilize the information acquired through electronic media to access biological information network and data bases in order to understand biological functions and then to evaluate genetic diseases, their causes and risks related to human kind.

Course Contents:

Module I: Introduction

Module II: Programming strategies
Objects and ADTs with example, Constructors and destructors, Data structure, methods, Pre and post conditions, C conventions, Error handling, Some programming language notes.

Module III: Data structures
Arrays; lists; stacks and stack frames; Recursion -Recursive functions with example of factorial, Queue, Degeue.

Module IV: Searching
Sequential and binary search, Trees, binary search tree, complexity.

Module V: Queues
Priority queues and heaps

Module VI: Sorting
Bubble, Heap, Quick, Bin, Radix

Module VII: Searching revisited
Red-Black trees, AVL trees, general n-ary trees, hash tables; Hashing and collision resolution

Module VIII: Dynamic algorithm
Fibonacci numbers, bionomial coefficients, optimal binary search trees, matrix chain multiplication, longest common subsequence, optimal triangulation.

Module IX: Graphs
Minimum spanning tree and Dijkstra’s algorithm

Module X: Huffman encoding, FFT, Hard or intractable problems
Eulerian or Hamiltonian paths, Travelling salesman problem.

Examination Scheme:

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Text & References:

Text:
- Database Design, Development and Deployment with Student CD, P. Rob and E. Semaan, McGraw-Hill/Irwin
- Schaum’s Outline of Data Structures with C++, J.R. Hubbard, McGraw Hill Trade.

References:
Database system concepts, A. Silberschatz, P.B. Galvin and G. Gagne, John Wiley and Sons Inc.
- Introduction to Data Structures and Application, J. Tremblay and P.G. Sorensen, McGraw Hill College Division
RESEARCH METHODOLOGY

Course Code:    UMT 405        Credit Units: 02

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

Course Contents:

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

Module II

Module III: Sampling techniques

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

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

Examination Scheme:

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Text & References:

Text:
- Statistical Methods By S.P. Gupta

References:
- Research Methodology Methods and Techniques By C.R. Kothari
- Statistics(Theory and Practice) By B.N. Gupta
- Research Methodology Methods and statistical Techniques By Santosh Gupta
- Scientific journals and magazines
Course Code: UMT 420 Credit Units: 02

Course Contents:

Module I
Colour reactions of proteins (Ninhydrin test, Biuret test, Xanthoprotein test).
Estimation of proteins.

Module II
Biochemical estimation of DNA
Biochemical estimation of RNA
Quantitative determination of DNA and RNA by spectrophotometric method using UV range.
Determination of melting temperature of DNA from thermal denaturation characteristics.

Examination Scheme:

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Course Code: UMT 421 Credit Units: 02

Course Contents:

a. Study of gene interaction.
b. Study of chromosomal translocation in Rhoeo discolor.
c. Study of bacterial conjugation.
d. Study of bacterial transduction.
e. Study of physical and chemical mutagens on growth of E. coli.
f. PTC test.

Examination Scheme:

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METHODS AND INSTRUMENTATION IN BIOTECH LAB

Course Code: UMT 422
Credit Units: 01

Course Contents:

Module I
Cell disruption techniques

Module II
Centrifugation – low speed and high speed.

Module III
Spectrophotometer techniques

Module IV
Chromatography – Paper Chromatography and Thin Layer Chromatography

Module V
Electrophoresis – SDS Page and Agarose gel electrophoresis.

Module VI
Light microscopy and Electron

Examination Scheme:

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

Course Code: UMT 423                  Credit Units: 01

Course Contents:

Module I
Stack implementation through arrays, link list

Module II
Programs for recursion functions

Module III
Implementation of queues and leap structures

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

Module V
A VL tree implementation

Module VI
Optimal matrix multiplication

Examination Scheme:

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Note: Minor variation could be there depending on the examiner
COMMUNICATION SKILLS - II

Course Code: UMT 441 Credit Units: 01

Course Objective:
To teach the participants strategies for improving academic reading and writing. Emphasis is placed on increasing fluency, deepening vocabulary, and refining academic language proficiency.

Course Contents:

Module I: Social Communication Skills
Small Talk
Conversational English
Appropriateness
Building rapport

Module II: Context Based Speaking
In general situations
In specific professional situations
Discussion and associated vocabulary
Simulations/Role Play

Module III: Professional Skills
Presentations
Negotiations
Meetings
Telephony Skills

Examination Scheme:

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</table>

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

Text & References:

- Essential Telephoning in English, Garside/Garside, Cambridge
- Working in English, Jones, Cambridge
- Business Communication, Raman – Prakash, Oxford
- Speaking Personally, Porter-Ladousse, Cambridge
- Speaking Effectively, Jermy Comfort, et.al, Cambridge
- Business Communication, Raman – Prakash, Oxford
Course Code: UMT 443
Credit Units: 01

Course Objective:
To understand the basis of interpersonal relationship
To understand various communication style
To learn the strategies for effective interpersonal relationship

Course Contents:

Module I: Understanding Relationships
Importance of relationships
Role and relationships
Maintaining healthy relationships

Module II: Bridging Individual Differences
Understanding individual differences
Bridging differences in Interpersonal Relationship – TA
Communication Styles

Module III: Interpersonal Relationship Development
Importance of Interpersonal Relationships
Interpersonal Relationships Skills
Types of Interpersonal Relationships

Module IV: Theories of Interpersonal Relationships
Theories: Social Exchange, Uncertainty Reduction Theory
Factors Affecting Interpersonal Relationships
Improving Interpersonal Relationships

Module V: Impression Management
Meaning & Components of Impression Management
Impression Management Techniques
Impression Management Training-Self help and Formal approaches

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
- Foster John, Effective Writing Skills: Volume-7, First Edition 2000, Institute of Public Relations (IPR)
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.
Course Objective:
To enable students:
- To develop strategies of comprehension of texts of different origin
- To present facts, projects, plans with precision

Course Contents:

Module C: pp. 104 – 139: Unités 8, 9

Contenu lexical:

Unité 8: Découvrir le passé
1. parler du passé, des habitudes et des changements.
2. parler de la famille, raconter une suite d’événements/préciser leur date et leur durée.
3. connaître quelques moments de l’histoire

Unité 9: Entreprendre
1. faire un projet de la réalisation: (exprimer un besoin, préciser les étapes d’une réalisation)
2. parler d’une entreprise
3. parler du futur

Contenu grammatical:
1. Imparfait
2. Pronom « en »
3. Futur
4. Discours rapporté au présent
5. Passé récent
6. Présent progressif

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

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

Course Code: UMT 445                      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.
Introduction to Advanced Grammar Language and Professional Jargon

Course Contents:

Module I: Present perfect tense
Present perfect tense, usage and applicability
Usage of this tense to indicate near past
Universal applicability of this tense in German

Module II: Letter writing
To acquaint the students with the form of writing informal letters.

Module III: Interchanging prepositions
Usage of prepositions with both accusative and dative cases
Usage of verbs fixed with prepositions
Emphasizing on the action and position factor

Module IV: Past tense
Introduction to simple past tense
Learning the verb forms in past tense
Making a list of all verbs in the past tense and the participle forms

Module V: Reading a Fairy Tale
Comprehension and narration
- Rotkäppchen
- Froschprinzessin
- Die Fremdsprache

Module VI: Genitive case
Genitive case – Explain the concept of possession in genitive
Mentioning the structure of weak nouns

Module VII: Genitive prepositions
Discuss the genitive propositions and their usage: (während, wegen, statt, trotz)

Module VIII: Picture Description
Firstly recognize the persons or things in the picture and identify the situation depicted in the picture;
Secondly answer questions of general meaning in context to the picture and also talk about the personal experiences which come to your mind upon seeing the picture.

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 - IV

### Course Code:
UMT 446

### Credit Units:
02

### Course Objective:
To enable students acquire working knowledge of the language; to give them vocabulary, grammar, voice modulations/intonations to handle everyday Spanish situations with ease.

### Course Contents:

**Module I**
Revision of earlier semester modules  
Introduction to Present Continuous Tense (Gerunds)

**Module II**
Translation with Present Continuous Tense  
Introduction to Gustar, Parecer, Apetecer, doler

**Module III**
Imperatives (positive and negative commands of regular verbs)

**Module IV**
Commercial/business vocabulary

**Module V**
Simple conversation with help of texts and vocabulary  
En la recepcion del hotel  
En el restaurante  
En la agencia de viajes  
En la tienda/supermercado

### Examination Scheme:

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C – Project + Presentation  
I – Interaction/Conversation Practice

### Text & References:
- Español Sin Fronteras (Nivel – Elemental)
Course Objective:
To enable the students to comfortably interact using basic Japanese.
Note: Teaching is done in roman as well as Japanese script, students will be taught katankana (another form of script) in this semester i.e. to be able to write all the foreign words in Japanese.

Course Contents:

Module I
Comparison using adjectives, Making requests

Module II
Seeking permission

Module III
Practice of conversations on:
Visiting people, Party, Meetings, After work, At a ticket vending machine etc

Module IV
Essays, writing formal letters

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

Methods of Private study /Self help
➢ Handouts, audio-aids, and self-do assignments, role-plays.
➢ Students are also encouraged to attend Japanese film festival and other such fairs and workshops organized in the capital from time to time.

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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:**
How many characters are there? The early Qing dynasty dictionary included nearly 50,000 characters the vast majority of which were rare accumulated characters over the centuries. An educate person in China can probably recognize around 6000 characters. 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**
Dialogue Practice
Observe picture and answer the question
Pronunciation and intonation
Character writing and stroke order.
Electronic items

**Module II**
Traveling – The Scenery is very beautiful
Weather and climate
Grammar question with – “bu shi …. Ma?”
The construction “yao … le” (Used to indicate that an action is going to take place)
Time words “yiqian”, “yiwi” (Before and after).
The adverb “geng”.

**Module III**
Going to a friend house for a visit meeting his family and talking about their customs.
Fallen sick and going to the Doctor, the doctor examines, takes temperature and writes prescription.
Aspect particle “guo” shows that an action has happened some time in the past.
Progressive aspect of an actin “zhengzai” Also the use if “zhe” with it.
To welcome someone and to see off someone …. I cant go the airport to see you off… etc.

**Module IV**
Shipment. Is this the place to checking luggage?
Basic dialogue on – Where do u work?
Basic dialogue on – This is my address
Basic dialogue on – I understand Chinese
Basic dialogue on – What job do u do?
Basic dialogue on – What time is it now?

**Module V**
Basic dialogue on – What day (date) is it today?
Basic dialogue on – What is the weather like here.
Basic dialogue on – Do u like Chinese food?
Basic dialogue on – I am planning to go to China.

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C – Project + Presentation
I – Interaction/Conversation Practice

**Text & References:**
- “Elementary Chinese Reader, Part-2” Lesson 31-38
PLANT BIOTECHNOLOGY

Course Code: UMT 501            Credit Units: 03

Course Objective:
The application of Plant Biotechnology covers major areas related to commercial applications. Regeneration of plants through *in vitro* techniques offers a practical strategy for micro propagation. Importance will also be given to areas like *in vitro* fertilization, animal cell and tissue culture, hormone vaccine and important enzyme production through animal biotechnology.

Course Contents:

**Module I**
- Historical perspective of plant tissue culture.
- Tissue culture lab and organization
- Sterilisation techniques
- Types of nutrient media and media composition
- Plant regeneration pathways
- Role of phytohormones
- Cell culture techniques- cell, tissue, organ cultures, callus culture, suspension culture
- Culture techniques Callus culture, cell culture and protoplast cultures.

**Module II**
- Organogenesis and somatic embryogenesis.
- Applications of plant tissue and cell culture.
- Micropopogation, pathogen free plants. production haploids,
- Somaclonal variation, preservation of germplasm.

**Module II**
- Genetic engineering in plants, - transformation vectors
- Gene transfer techniques-vector mediated and vector less gene transfer.
- Transgenic plants trans gene integration and expression

**Module III**
- Transgenic crop with new traits-herbicide tolerance, insect and disease resistance,
- Therapeutic proteins and compounds
- Oral vaccines
- Production of secondary metabolites via tissue culture
- Bioethics of plant genetic engineering.

Examination Scheme:

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</table>

Text & References:

- Plant Biotechnology and Transgenic Plants, K.M.O. Caldenty, W.H. Barz and H.L. Wills, Marcel Dekker.
ANIMAL BIOTECHNOLOGY

Course Code: UMT 502        Credit Units: 03

**Course Objective:**

**Course Contents:**

**Module I**
Historical perspectives, sterilization methods, organ culture - culture techniques, plasma clot, raft methods, agar gel, grid method, organ engineering.

**Module II**
Cell culture substrates, cultural media, natural and artificial media, initiation and maintenance of cell cultures, cell culture products, cryopreservation techniques, immobilized cultures

**Module III**
In vitro fertilization and embryo transfer

**Module IV**
Somatic cell hybridization, hybridoma technology

**Module V**
Animal genetic engineering - vectors, gene transfer methods - microinjection, virus mediated and other methods of gene transfer

**Module VI**
Transgenic animals with new traits, transgenic animals as bioreactors for producing pharmaceutically important compounds and therapeutic etc.

**Module VII**
Bioethical issues related to animal biotechnology,

**Examination Scheme:**

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**Text & References**

- Cell Culture LabFAX, M. Butler and M. Dawson, Bios scientific Publications Ltd.
- Cell Growth and Division – A Practical approach, R. Basega, IRL Press
- Culture of Animal Cells, R.I Freshney, Wiley-Leiss
- Comprehensive Biotechnology, Moo-Young, Alan T. Bullm Howard Dalton, Panima Publication
MOLECULAR BIOLOGY

Course Code: UMT 503        Credit Units: 05

Course Objective:
The aim is to extend understanding of the molecular mechanisms via which genetic information is stored, expressed and transmitted among generations.

Course Contents:

Module I: DNA Replication and repair
Mechanism of Prokaryotic and Eukaryotic DNA replication, Enzymes and accessory proteins involved in DNA replication, DNA repair Mechanism.

Module II: Transcription
Prokaryotic transcription, Eukaryotic transcription, RNA polymerase, General and specific transcription factors, Regulatory elements.

Module III: Modifications in RNA
5'-cap formation, transcription termination, 3 '-end processing and polyadenylation, Splicing, Editing, Nuclear export of mRNA and mRNA stability.

Module IV: Translation
Prokaryotic and Eukaryotic translation, the translation Machinery; Mechanisms of initiation, elongation and termination, regulation of translation, co-and post-translational modifications of proteins.

Module V: Regulation of Gene Expression in prokaryotic and eukaryotic systems
Lac operon, Ara operon, regulation in Eukaryotes

Module VI: Antisense and Ribozyme technology
Molecular mechanism of antisense molecules, inhibition of spilicing, polyadenylation and translation, disruption of RNA structure and capping, Biochemistry of Ribozyme; Hammerhead, hairpin and other ribozymes, strategies for designing ribozymes, applications of antisense and ribozyme technologies.

Examination Scheme:

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Text & References:

Text:
- Genome, T.A. Brown, John Willey & Sons Inc.

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

Course Contents:

Module I: Overview and historical perspective
File systems vs. DBMS, advantages of DBMS

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

Module III: SQL and Perl

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

Module V: Current trends
Distributed databases and multimedia databases;

Module VI: Data warehousing and Data Mining

Examination Scheme:

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Text & References:

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

References:
- Introduction to Database Systems, C.J. Date, Addison Wesley Publishing.
- Data Mining, A.K. Pujari, Sangam Books Ltd.
- Principles of Database and Knowledge Based systems, J.D. Ullman, Computer Science Press.
- The Data Warehouse Lifecycle Toolkit, John Wiley and Sons Inc.
- The Data Warehouse Toolkit, R. Kimball et al, John Wiley and Sons Inc.
Course Objective:
The knowledge gained through chemical reaction engineering and material and energy balances will help the students to understand the tools and techniques of biotechnology.

Course Contents:

Module I: Material and Energy Balances
Units and dimensions, Dimensional analysis; Simple problems on material balance calculations involving unit processes and reactive systems; Available electron balances. Basic energy concepts - enthalpy changes in chemical/biochemical reactions and in non-reactive processes, Energy balance calculations, Use of Steam tables; Heat of reaction and energy balance for microbial processes.

Module II: Chemical reaction engineering
Kinetics of homogenous reactions: Concepts of reaction rate, order of reaction and molecularity, Analysis of batch reactors for kinetic interpretation of data and isothermal reactor design for single and multiple reactions, Design equations for CSTR and plug flow reactors.

Module III: Instrumentation and process control
Principles of measurement: error, accuracy and sensitivity; Measurement of flow, pressure, temperature, level, pH, viscosity and chemical composition. Basic concepts of feedback control, control loop and its elements, Dynamic behaviour of first, second and higher order physical systems, controller hardware, choice of controllers and settings. Introduction to advanced control systems: feed forward, cascade and ratio control.

Examination Scheme:

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Text & References:

Text:
- Basic Principles and Calculations in Chemical Engineering, D.M. Himmelblau, Prentice Hall.

References:
- Chemical Reaction Engineering, O. Levenspiel, John Wiley and Sons Inc.
- Process Modelling, Simulation and Control for Chemical Engineers, W.L. Luyben, McGraw Hill.
PLANT BIOTECHNOLOGY LAB

Course Code: UMT 520
Credit Units: 02

Course Contents:

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

Module II
Preparation and sterilization of different explants.
Inoculation of explants on culture media.

Module III
Study of viability of seeds.
Embryo culture.

Examination Scheme:

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ANIMAL BIOTECHNOLOGY LAB

Course Code: UMT 521  Credit Units: 02

Course Contents:

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

Examination Scheme:

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Course Contents:

Module I
Preparation of DNA: genomic, Plasmid

Module II
Isolation of RNA

Module III
RFLP analysis

Module IV
Gel filtration

Module V
Preparation of Competent Cells

Module VI
Restriction Digestion and Ligation of DNA

Examination Scheme:

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Note: Minor variation could be there depending on the examiner
DATABASE MANAGEMENT LAB

Course Code: UMT 523    Credit Units: 01

Course Contents:

Module I
Database creation using DDL and DML.

Module II
Defining the primary and secondary keys.

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

Module IV
Normalization of databases with SQL and Perl

Module V
Implementation of transactions and schedules.

Module VI
Detection of association rules and knowledge recovery.

Examination Scheme:

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Note: Minor variation could be there depending on the examiner
GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student. Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage. The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

Methodology

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

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

Report Layout

The report should contain the following components:

- **Title or Cover Page**
  The title page should contain the following information: Project Title; Student’s Name; Course; Year; Supervisor’s Name.

- **Acknowledgements** (optional)
  Acknowledgment to any advisory or financial assistance received in the course of work may be given.

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

- **Table of Contents**
  Titles and subtitles are to correspond exactly with those in the text.

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

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

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

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

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

- **Future prospects**

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

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

**Examples**

**For research article**


**For book**


**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:**

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<td><strong>Total</strong></td>
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COMMUNICATION SKILLS - III

Course Code: IMT 541      Credit Units: 01

Course Objective:
To equip the participant with linguistic skills required in the field of science and technology while guiding them
to excel in their academic field.

Course Contents:

Module I
Reading Comprehension
Summarising
Paraphrasing

Module II
Essay Writing
Dialogue Report

Module III
Writing Emails
Brochure
Leaflets

Module IV: Introduction to Phonetics
Vowels
Consonants
Accent and Rhythm
Accent Neutralization
Spoken English and Listening Practice

Examination Scheme:

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</table>

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

Text & References:

- Effective English for Engineering Students, B Cauveri, Macmillan India.
- Creative English for Communication, Krishnaswamy N, Macmillan.
Course Code: UMT 543  Credit Units: 01

Course Objective:
To inculcate in the students an elementary level of understanding of group/team functions.
To develop team spirit and to know the importance of working in teams.

Course Contents:

Module I: Group formation
Definition and Characteristics
Importance of groups
Classification of groups
Stages of group formation
Benefits of group formation

Module II: Group Functions
External Conditions affecting group functioning: Authority, Structure, Org. Resources, Organizational policies etc.
Internal conditions affecting group functioning: Roles, Norms, Conformity, Status, Cohesiveness, Size, Inter group conflict.
Group Cohesiveness and Group Conflict
Adjustment in Groups

Module III: Teams
Meaning and nature of teams
External and internal factors effecting team
Building Effective Teams
Consensus Building
Collaboration

Module IV: Leadership
Meaning, Nature and Functions
Self leadership
Leadership styles in organization
Leadership in Teams

Module V: Power to empower: Individual and Teams
Meaning and Nature
Types of power
Relevance in organization and Society

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.
- Dressers, David and Cans, Donald: The Study of Human Interaction.
Course Code: UMT 544
Credit Units: 02

Course Objective:
To furnish some basic knowledge of French culture and civilization for understanding an authentic document and information relating to political and administrative life

Course Contents:

Module D: pp. 131 – 156 Unités 10, 11

Contenu lexical:

Unité 10: Prendre des décisions
1. Faire des comparaisons
2. décrire un lieu, le temps, les gens, l'ambiance
3. rédiger une carte postale

Unité 11: faire face aux problèmes
1. Exposer un problème.
2. parler de la santé, de la maladie
3. interdire/demander/donner une autorisation
4. connaître la vie politique française

Contenu grammatical:

1. comparatif - comparer des qualités/ quantités/actions
2. supposition : Si + présent, futur
3. adverbe - caractériser une action
4. pronom "Y"

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

• le livre à suivre: Campus: Tome 1
Course Code: UMT 545  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
Introduction to Advanced Grammar and Business Language and Professional Jargon

Course Contents:

Module I: Genitive case
Genitive case – Explain the concept of possession in genitive
Mentioning the structure of weak nouns

Module II: Genitive prepositions
Discuss the genitive propositions and their usage: (während, wegen, statt, trotz)

Module III: Reflexive verbs
Verbs with accusative case
Verbs with dative case
Difference in usage in the two cases

Module IV: Verbs with fixed prepositions
Verbs with accusative case
Verbs with dative case
Difference in the usage of the two cases

Module V: Texts
A poem 'Maxi'
A text Rocko

Module VI: Picture Description
Firstly recognize the persons or things in the picture and identify the situation depicted in the picture;
Secondly answer questions of general meaning in context to the picture and also talk about the personal experiences which come to your mind upon seeing the picture.

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 Code: UMT 546      Credit Units: 02

Course Objective:
To enable students acquire working knowledge of the language; to give them vocabulary, grammar, voice modulations/intonations to handle everyday Spanish situations with ease.

Course Contents:

Module I
Revision of earlier semester modules

Module II
Future Tense

Module III
Presentations in English on
Spanish speaking countries’
Culture
Sports
Food
People
Politics
Society
Geography

Module IV
Situations:
En el hospital
En la comisaria
En la estacion de autobus/tren
En el banco/cambio

Module V
General revision of Spanish language learnt so far.

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

• Español Sin Fronteras, Greenfield
Course Objective:
To enable the students to converse, read and write language comfortably and be able to converse using different patterns and forms taught through out. Students are taught and trained enough to get placed themselves in Japanese companies.

Note: Teaching is done in roman as well as Japanese script.

Course Contents:

Module I
Dictionary form of the verbs, Joining of verbs
Negative form of verbs
Potential form

Module II
Joining of many actions together
Usage of dictionary form of the verbs in sentences
Introducing colloquial language.

Module III
Direct form of the speech, quotations,
Expressing thoughts
Actions and reasoning

Module IV
Conclusion
Receiving and giving things, favour etc.
Different forms like ‘tara’ form.

Module V
Revision of the whole syllabus

Learning Outcome
➢ Students can speak and use different patterns, ways to describe a particular situation and can converse comfortably in mentioned situations through out.
➢ Students can appear in the interviews for placements in Japanese companies.

Methods of Private study /Self help
➢ Teaching will be supported by handouts, audio-aids, and self-do assignments and role plays.
➢ 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:
What English words come from Chinese? Some of the more common English words with Chinese roots are ginseng, silk, dim sum, fengshui, typhoon, yin and yang, T’ai chi, kung-fu. 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.
 Pronunciation and intonation.
 Character writing and stroke order

Module II
Intonation
Chinese foods and tastes – tofu, chowmian, noodle, Beijing duck, rice, sweet, sour….etc. Learning to say phrases like – Chinese food, Western food, delicious, hot and spicy, sour, salty, tasteless, tender, nutritious, god for health, fish, shrimps, vegetables, cholesterol is not high, pizza, milk, vitamins, to be able to cook, to be used to, cook well, once a week, once a month, once a year, twice a week…… Repetition of the grammar and verbs taught in the previous module and making dialogues using it.
Compliment of degree “de”.

Module III
Grammar the complex sentence “suiran … danshi…..”
Comparison – It is colder today than it was yesterday…..etc.
The Expression “chule….yiwai”. (Besides)
Names of different animals.
Talking about Great Wall of China
Short stories

Module IV
Use of “huozhe“ and “haishi”
Is he/she married?
Going for a film with a friend.
Having a meal at the restaurant and ordering a meal.

Module V
Shopping – Talking about a thing you have bought, how much money you spent on it? How many kinds were there? What did you think of others?
Talking about a day in your life using compliment of degree “de”. When you get up? When do you go for class? Do you sleep early or late? How is Chinese? Do you enjoy your life in the hostel?
Making up a dialogue by asking question on the year, month, day and the days of the week and answer them.

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

• “Elementary Chinese Reader” Part-II Lesson 39-46
RECOMBINANT DNA TECHNOLOGY

Course Code: UMT 601      Credit Units: 04

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

Course Contents:

Module I: Introduction to the subject and the tools used in RDT
Restriction endonuclease, methyltransferase, ligase, polymerase, kinase, phosphatase, nuclease, transferase, reverse transcriptase, linkers, adapters DNA, RNA and protein markers.

Module II: Overview of cloning vectors
Plasmids, bacteriophages (Lambda and M13), phagemids, cosmids, artificial chromosomes (YAC, BAC).

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

Module IV: Nucleic acid amplification and its applications
Basics of PCR, site directed mutagenesis.

Module V: Cloning and selection of clones
Basic cloning experiment: Design of cloning strategy and stepwise experimental procedure including application of tools introduced in module I. Complementation, colony and plaque hybridization, restriction, PCR, plus-minus screening, immunoscreening.

Module VI: Heterologous gene expression
Overview of expression vectors (Bacteria and yeast), vector engineering (fusion tags, antibiotic markers), codon optimization, host engineering

Module VII: DNA Libraries
Purpose of constructing DNA libraries. Construction of cDNA and genomic libraries.

Module VIII: Advanced techniques in RDT
Primer extension mapping, S1 mapping, RNase protection assay, two and three hybrid systems, subtractive hybridization, gel retardation assay, DNase footprinting, in vitro transcription and translation, phage display, DNA sequencing (Maxam Gilbert, Sanger’s and automated), protein engineering.

Examination Scheme:

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Text & References:

Text:
- Recombinant DNA, J.D. Watson et al, W.H. Freeman and Company

References:
ENZYMEOLOGY AND ENZYME TECHNOLOGY

Course Code: UMT 602      Credit Units: 04

Course Objective:
The course aims to provide an understanding of the principles and application of proteins, secondary metabolites
and enzyme biochemistry in therapeutic applications and clinical diagnosis. The theoretical understanding of
biochemical systems would certainly help to interpret the results of laboratory experiments.

Course Contents:

Module I: Enzymes
Introduction and scope, Nomenclature, Mechanism of Catalysis.

Module II
Specificity of enzyme action, monomeric and oligomeric enzymes, Enzyme inhibition.

Module III: Enzyme Kinetics
Single substrate steady state kinetics; Michaelis Menten equation, Linear plots, King-Altman’s method;
Inhibitors and activators; Multisubstrate systems; ping-pong mechanism, Alberty equation, Sigmoidal kinetics
and Allosteric enzymes

Module IV
Extraction & purification of enzymes.

Module V
Immobilization of Enzymes; Advantages, Carriers, adsorption, covalent coupling, cross-linking and entrapment
methods, Micro-environmental effects.

Module VI: Biotechnological applications of enzymes
Large scale production and purification of enzymes, enzyme utilization in industry, enzymes and recombinant
DNA technology

Examination Scheme:

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Text & References:

Text:
- Biotechnological Innovations in Chemical Synthesis, R.C.B. Currell, V.D. Mieras, Biotol Partners Staff,
  Butterworth Heinemann.
- Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis, R.A. Copeland, John Wiley
  and Sons Inc.

References:
- Enzymes Biochemistry, Biotechnology, Clinical Chemistry, Trevor Palner
- Enzyme Kinetics: Behavior and Analysis of Rapid Equilibrium and Steady State Enzyme Systems, I.H.
  Segel, Wiley-Interscience
- Industrial Enzymes & their applications, H. Uhlig, John Wiley and Sons Inc.
Course Objective:
The objective is to describe relational data models and database management systems with an emphasis on biologically important techniques to store various data on DNA sequencing structures, genetic mapping, etc.

Course Contents:

Module I: Introduction and overview
The NCBI data model; sequence databases, sequence retrieval, sequence file formats, submitting DNA and protein sequences.
Complexity of gene structure and function; Restriction maps and multiple maps - introduction, double digest problem, classifying multiple solutions; Cloning and clone libraries - libraries by complete and partial digestion; Physical genome maps - mapping by fingerprinting and mapping by anchoring, clone overlap and sequence assembly; Shotgun sequencing, sequencing by hybridization.

Module II: Database searching
Types of biological databases, Databases and rapid sequence analysis - Tree representation of a sequence, hashing a sequence repeats in a sequence, sequence comparison by hashing, sequence comparison by at most I mismatches, sequence comparison by statistical content

Module III: Multiple sequence alignment
Global and local alignments, statistical significance of alignments, database searching algorithms and artifacts, scoring matrices and gap penalties, filtering, position specific scoring matrices, internet resources, uses of pairwise and multiple sequence alignment, programs and methods for sequence alignment, pattern searching programs, family and superfamily representation, structural inference, dynamic programming algorithms, alignment by hidden Markov models, consensus word analysis, more complex scoring.

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Text & References:

Text:

References:
Course Objective:
The course material on the kinetics of microbial growth, substrate utilization and product formation etc. may help the students to understand the various principles involved in instrumentation and control of bioprocess.

Course Contents:

Module I
Kinetics of microbial growth, substrate utilization and product formation;

Module II
Sterilization of air and medium;

Module III
Batch, continuous and fed batch reactors; mass and energy balance in microbial processes

Module IV
Mass transfer in Biological reactions; Scale-up principles; Instrumentation and control of bioprocesses.

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Text & References:

Text:
- Biochemical Engineering- Kinetics, Mass Transport, Reactors and Gene Expression, W F Weith, John Wiley and Sons Inc
- Biochemical Engineering, S Aiba, A E Humphery and N F Millis, University of Tokyo Press
- Biochemical Engineering Fundamentals, J E Baily and D F Oillis, McGraw Hill
- Bioprocess Engineering Principles, P Doran, Academic Press

References:
- Chemical Engineering, J M Coulson, and J F Richardson, Butterwirth Heinemann
- Process Engineering in Biotechnology, A T Jackson, Prentice Hall
Course Objective:
The course aims to provide an understanding of the principles and applications of proteins, enzymes and nucleic acids for their role in biochemical pathway as well as interactions among themselves.

Course Contents:

**Module I: Chemistry of amino acids and peptides**
Side chain structure and function in protein folding and functionality: Secondary structure of proteins - helices, sheets, loops and turns; Structural and functional proteins. Tertiary structure of proteins, homo and heterodimers, trimers and tetramers; forces governing protein-protein interactions; open tertiary structure; Classification of proteins; Structure and function of an antibody; structure of hemoglobin, muscle proteins; Sequence and structural motifs in proteins.

**Module II: Protein-ligand interactions**
Lock and key versus handshake mechanism of substrate recognition; structural basis of recognition; reaction mechanisms of enzymes, G-Protein coupled receptors.

**Module III: Protein solubility, protein stability and stabilization**
Salting in and salting out, Parameters affecting; enthalpic and entropic stabilization, mutations increasing stability, helix capping; Native, partially denatured and denatured proteins; Protein denaturation, Physical and chemical denaturants; Refolding.

**Module IV: DNA structure**
Covalent structure of DNA, base pairing, hydrogen bonding, DNA melting and annealing, difference between AT and GC pairing, DNA models, The Watson Crick model; Crystal structure of B-DNA, major and minor grooves, dyad symmetry, base pair stacking, propellor twist, A and Z- DNA, triple stranded DNA, telomeric sequences and structure, G-quartcts, palindromic and tandem sequences, Base pair flipping and DNA bulges, DNA methylation; Protein-DNA interactions; drug-DNA interactions; Databases of sequences and structure for protein and DNA, public domain softwares for visualizing and modeling biomolecules -Rasmol, Deepview, Whatif.

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Text & References:

**Text:**
- Biochemistry, R.H. Abeles, P.A. Frey and W.A. Jencks, Jones and Bartlett.
- Essentials of Molecular Biology, D. Freifelder, Jones and Bartlett Publications.
- Genes VII, B. Lewin, Oxford University Press.

**References:**
- Introduction to Protein Structure, C. Branden and J Tooze, Garland Publishing Company.
- Protein Structure, M. Perutz, Oxford University Press.
- Database Annotation in Molecular Biology, Arthur M. Lesk.
- From Genes to Clones, E.L. Winnacker.
- Genes & Genomes, M.S. Paul Berg.
- Structure and Mechanism in Protein Science, Alan Fersht.
IMMUNOLOGY AND IMMUNOTECHNOLOGY

Course Code: UMT 606        Credit Units: 03

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

Course Contents:

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

Module II: Major Histocompatibilty
MHC, BCR and TCR, generation of antibody diversity, Complement system

Module III: Cells of the immune system
Hematopoiesis and differentiation, lymphocyte trafficking, B-Lymphocytes, T -Lymphocytes, macrophages, dendritic cells, natural killer, lymphokines and lymphokine activated killer cells, eosinophils, neutrophils and mast cells

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

Module V: Cell mediated toxicity
Mechanism of T cell and NK cell mediated lysis and macrophage mediated cytotoxicity.

Module VI: Hypersensitivity

Module VII: Autoimmunity

Module VIII: Tumor immunology, Immunity to infectious agents

Module IX: Transplantation Immunology

Module X: Synthetic vaccines
Vaccines: General consideration, ideotype network hypothesis, Synthetic vaccines

Module XI: Immunological Techniques
Immuno diffusion, immuno-electrophoresis, ELISA, RIA, fluorescence activated cell sorter

Module XII: Hybridoma technology and its applications
Fusion of myeloma cells with lymphocytes

Examination Scheme:

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Text & References:

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

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

Course Code: UMT 620 Credit Units: 01

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

Course Contents:

Module I
Quantitation of nucleic acids (Spectrophotometric, Gel based and Saran wrap method)

Module II
Restriction Digestion and Ligation

Module III
Construction of restriction map of plasmid DNA.

Module IV
Blotting techniques

Module V
PCR amplification and site directed mutagenesis

Module VI
Optimization of gene expression in *E.coli* and analysis of expressed product

Examination Scheme:

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Note: Minor variation could be there depending on the examiner
ENZYMEOLOGY AND ENZYME TECHNOLOGY LAB

Course Code: UMT 621 Credit Units: 01

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

Course Contents:

Module I
Isolation of enzymes from plant and microbial sources.

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

Module III
Purification of Enzyme by ammonium sulphate fractionation.

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

Module V
Effect of Temperature and pH on enzyme activity.

Module VI
Enzyme immobilization

Examination Scheme:

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Note: Minor variation could be there depending on the examiner.
COMPUTATIONAL BIOLOGY LAB - I

Course Code: UMT 622
Credit Units: 01

List of Experiments/Exercises

1. Basics of sequence analysis Retrieving a sequence-nucleic acid/Protein
2. Local and Global Alignment- concepts Pair wise sequence alignment
3. Multiple sequence alignment
4. DOT Matrix Analysis
5. Analysis Using Scoring Matrices
6. Dynamic Programming – Smith Watermann Algorithm Needleman Wunsch Algorithm

Examination Scheme:

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

Course Code: UMT 623        Credit Units: 01

Course Contents:

1. Study of physical properties of proteins.
2. Analysis of protein structure.
4. Study of protein fractionation.
5. Study of protein folding.

Examination Scheme:

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Course Code: UMT 624  Credit Units: 01

Course Contents:

Module I
Blood film preparation and identification of cells.

Module II
Identification of blood group.

Module III
Isolation of serum.

Module IV
Lymphoid organs and their microscopic organization.

Module V
WIDAL Test

Module VI
Radial Immuno Diffusion Test

Module VII
Ouchterlony Double diffusion Test

Module VIII: Elisa
DOT, SANDWICH

Module IX
Purification of IgG through affinity chromatography

Module X
Immunohistochemistry

Examination Scheme:

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COMMUNICATION SKILLS - IV

Course Code: IMT 641
Credit Units: 01

Course Objective:
To enhance the skills needed to work in an English-speaking global business environment.

Course Contents:

Module I: Business/Technical Language Development
Advanced Grammar: Syntax, Tenses, Voices
Advanced Vocabulary skills: Jargons, Terminology, Colloquialism
Individualised pronunciation practice

Module II: Social Communication
Building relationships through Communication
Communication, Culture and Context
Entertainment and Communication
Informal business/ Technical Communication

Module III: Business Communication
Reading Business/ Technical press
Listening to Business/ Technical reports (TV, radio)
Researching for Business/Technology

Module IV: Presentations
Planning and getting started
Design and layout of presentation
Information Packaging
Making the Presentation

Examination Scheme:

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

Text & References:

- Business Communications, Rodgers, Cambridge.
- Working in English, Jones, Cambridge.
Course Objective:
- To develop an understanding of the concept of stress, its causes, symptoms, and consequences.
- To develop an understanding of the consequences of the stress on one’s wellness, health, and work performance.

Course Contents:

Module I: Stress
Meaning & Nature
Characteristics
Types of stress

Module II: Stages and Models of Stress
Stages of stress
The physiology of stress
Stimulus-oriented approach.
Response-oriented approach.
The transactional and interactional model.
Pressure – environment fit model of stress.

Module III: Causes and symptoms of stress
Personal
Organizational
Environmental

Module IV: Consequences of stress
Effect on behaviour and personality
Effect of stress on performance
Individual and Organizational consequences with special focus on health

Module V: Strategies for stress management
Importance of stress management
Healthy and Unhealthy strategies
Peer group and social support
Happiness and well-being

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:
- Pestonjee, D.M, Pareek, Uday, Agarwal Rita; Studies in Stress and its Management.
- Pestonjee, D.M.; Stress and Coping: The Indian Experience.
- Clegg, Brian; Instant Stress Management – Bring calm to your life now.
Course Objective:
To strengthen the language of the students both in oral and written so that they can:
i) express their sentiments, emotions and opinions, reacting to information, situations;
ii) narrate incidents, events;
iii) perform certain simple communicative tasks.

Course Contents:
Module D: pp. 157 – 168 – Unité 12

Unité 12: s'évader
1. présenter, caractériser, définir
2. parler de livres, de lectures
3. préparer et organiser un voyage
4. exprimer des sentiments et des opinions
5. téléphoner
6. faire une réservation

Contenu grammatical:
1. proposition relative avec pronom relatif "qui", "que", "où" - pour caractériser
2. faire + verbe

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

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

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 Advanced Grammar and Business Language and Professional Jargon.

Course Contents:

Module I: Adjective endings
Adjective endings in all the four cases discussed so far
Definite and indefinite articles
Cases without article

Module II: Comparative adverbs
Comparative adverbs as and like

Module III: Compound words
To learn the structure of compound words and the correct article which they take
Exploring the possibility of compound words in German

Module IV: Infinitive sentence
Special usage of ‘to’ sentences called zu+ infinitive sentences

Module V: Texts
A Dialogue: ‘Ein schwieriger Gast’
A text: ‘Abgeschlossene Vergangenheit’

Module VI: Comprehension texts
Reading and comprehending various texts to consolidate the usage of the constructions learnt so far in this semester.

Module VII: Picture Description
Firstly recognize the persons or things in the picture and identify the situation depicted in the picture;
Secondly answer questions of general meaning in context to the picture and also talk about the personal experiences which come to your mind upon seeing the picture.

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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 Code: UMT 646  Credit Units: 02

Course Objective:
To enable students acquire working knowledge of the language; to give them vocabulary, grammar, voice modulations/intonations to handle everyday Spanish situations in Present as well as in Present Perfect Tense with ease.

Course Contents:

Module I
Revision of the earlier modules

Module II
Present Perfect Tense

Module III
Commands of irregular verbs

Module IV
Expressions with Tener que and Hay que

Module V
En la embajada
Emergency situations like fire, illness, accident, theft

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Español, En Directo I A
- Español Sin Fronteras
JAPANESE - VI

Course Objective:
To enable the students to converse in the language with the help of verbs and the usage of different sentence patterns, which help them to strengthen the language.
Students are taught and trained enough to get placed in Japanese companies.
Note: The teaching is done in roman as well as Japanese script. 10 more kanjis are introduced in this semester.

Course Contents:

Module I: Polite form of verbs
Expressing feelings with the polite forms of verb.

Module II: Potential form
Ability of doing or not doing something

Module III: Conjunctions
Joining two sentences with the help of shi and mo

Module IV: Intransitive Verbs
Sentence patterns of indirect speech

Module V: Feelings and expressions
Regret, existence etc.

Learning Outcome
➢ Students can speak the language with the use of different forms of verb.

Methods of Private study/ Self help
➢ Hand-outs, audio -aids, assignments and role-plays will support classroom teaching.
➢ Students are encouraged to watch Japanese movies at Japan Cultural and information center.

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

• Shin Nihon-go no Kiso Lesson No. 26 to 30.
• All vocabulary and topics taught are from the above-mentioned book.
**Course Objective:**
Chinese emperor Qin Shi Huang – Ti who built the great wall of China also built a network of 270 palaces, linked by tunnels, and was so afraid of assassination that he slept in a different palace each night. 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.
Pronunciation and intonation.
Character writing and stroke order.

**Module II**
Going out to see a science exhibition
Going to the theatre.
Train or Plane is behind schedule.
Indian Economy-Chinese Economy
Talking about different Seasons of the Year and Weather conditions. Learning to say phrases like-spring, summer, fall, winter, fairly hot, very cold, very humid, very stuffy, neither hot nor cold, most comfortable, pleasant … etc.

**Module III**
Temperature – how to say – What is the temperature in May here?
- How is the weather in summer in your area?
- Around 30 degrees
- Heating, air-conditioning
- Is winter is Shanghai very cold?
Talking about birthdays and where you were born?
The verb “shuo” (speak) saying useful phrases like speak very well, do not speak very well, if speak slowly then understand if speak fast then don’t understand, difficult to speak, difficult to write, speak too fast, speak too slow, listen and can understand, listen and cannot understand … etc.
Tell the following in Chinese – My name is …. I was born in … (year). My birthday is ……. Today is … (date and day of the week). I go to work (school) everyday. I usually leave home at . (O’clock). In the evening, I usually …….. (do what)? At week end, I ………. On Sundays I usually …………… It is today….. It will soon be my younger sisters birthday. She was born in ….. (year). She lives in ………. (where). She is working (or studying)……. where… She lives in …….. (where.)

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C – Project + Presentation
I – Interaction/Conversation Practice

**Text & References:**
- Elementary Chinese Reader Part-2,3 ; Lesson 47-54.
COMPUTATIONAL BIOLOGY - II

Course Code: UMT 701      Credit Units: 04

Course Objective:
The objective is to describe how molecular data can be used to construct a phylogenetic tree and characterize the rates and causes of nucleotide substitutions. The aim is also to explain how a gene/protein family arises and the mechanisms which underlie evolution at the molecular level.

Course Contents:

Module I: Phylogenetic prediction
Trees-splits and metrics on trees, tree interpretation, Distance – additive, ultrametric and nonadditive distances, tree building methods, phylogenetic analysis, parsimony, tree evaluation, maximum likelihood trees – continuous time markov chains, estimating the rate of change, likelihood and trees; analysis software.

Module II: Predictive methods using DNA sequences
Annotation, comparison of different methods; ESTs – databases, clustering, gene discovery and identification, and functional classification.

Module III: Comparative genome analysis
Reconstruction of metabolic pathways; Genome analysis, genome anatomy, genome rearrangements with inversions, signed inversions, gene identification, gene expression, expression analysis, gene identification and functional classification.

Module IV: Predictive methods using protein sequences
Protein identification, physical properties, motifs and patterns, structure, folding classes, structure classification;

Module V: Structure databases
PDB and MMDB, structure file formats, visualizing structural information, advance structure modeling, Internal and external co-ordinate system, cartesian and cylindrical polar co-ordinate system, Potential energy calculations using semiempirical potential energy function, Electrostatic energy surface generation, three dimensional structure using dynamic programming methods, Molecular mechanics and dynamics, Docking of Molecules, Molecular Design, structure similarity searching; structure prediction in proteins.

Examination Scheme:

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Text & References:

Text:
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press
- Introduction to Computational Biology: Maps, Sequences and Genomes, M. Waterman, Chapman and Hall

References:
- Introduction to Bioinformatics, T. Attwood and D. Parry-Smith, Prentice Hall
- Biocomputing hypertext coursebook at http://www.techfak.unibielefeld.de/bcd/curric/welcome.html/
- Computational Modeling of Genetic and Biochemical Networks, J.M. Bower and H. Bolouri, MIT Press
- Essentials of Genomics and Bioinformatics, C.W. Sensen, John Wiley and Sons Inc.
Course Objective:
The present course aims to aware about the requirements for large-scale cultivation of microbes for production of industrially important products with the concept of scale up processes.

Course Contents:

Module I
Introduction to Bioprocess Technology, Microbial growth kinetics.

Module II
Substrates for bioconversion processes and design of media, sterilization; Cell culture techniques; Inoculum development and aseptic transfers. Bioreactors – Types and Design.

Module III
Process technology for the production of primary metabolites, e.g. Baker’s yeast, ethanol, citric acid, amino acids(lysine and glutamic acid).

Module IV
Microbial production of industrial enzymes– glucose isomerase, cellulase, amylase, lipase, protease.

Module V
Production of secondary metabolites – penicillins, cephalosporins and streptomycin.

Module VI
Biomass (SCP and mushroom) production from agro-residues.

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Text & References:

Text:
- Principles of Fermentation Technology, P.F. Stanbury and A. Whitaker, Pergamon Press.

References:
- Biochemical Engineering. S. Aiba, A.E. Humphrey and N.F. Millis, University of Tokyo Press.
DOWNSTREAM PROCESSING

Course Code: UMT 703  Credit Units: 04

Course Objective:
The syllabus will help the students to characterize the Bioproducts of biotechnological importance and to get expertise in their downstream processing.

Course Contents:

Module I
Characteristics of Bioproducts, Conditioning of broth, Mechanical separation, Filtration, Centrifugation, Cell disruption techniques, Protein precipitation and separation.

Module II
Aqueous - two-phase extraction; Adsorption-desorption processes; Membrane based separation: Dialysis, Electro dialysis, Micro filtration, Ultra filtration.

Module III
Chromatographic methods of separation based on size, charge, reverse phase, hydrophobic interactions, and biological affinity, HPLC, FPLC, MS-LC, Gas chromatography.

Module IV
Electrophoresis, principle, types on the basis of support media, 1D, 2D gel electrophoresis, continuous and capillary electrophoresis.

Module V
Crystallization, Drying, Case studies.

Examination Scheme:

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Text & References:

Text:
- Bioseparations: Downstream Processing for Biotechnology, P.A. Belter et al, John Wiley and Sons Inc.

References:
- Practical Biochemistry, Principles & Techniques, Keith Wilson and John Walker
- Bioseparations: Principles and Techniques, Sivasankar, Prentice-Hall
- Biochemical Engineering Fundamentals, J.E. Bailey and D.F. Ollis, McGraw-Hill
- Biotreatment, Downstream Processing and Modelling (Advances in Biochemical Engineering/Biotechnology, Vol.56), T. Scheper et al, Springer Verlag
- Chromatographic and Membrane Processes in Biotechnology, C.A. Costa and J.S. Cabral, Kluwer Academic Publisher
- Downstream Processing, J.P. Hamel, J.B. Hunter and S.K. Sikdar, American Chemical Society
- Protein Purification, M.R. Ladisch, R.C. Wilson, C.C. Painton and S.E. Builder, American Chemical Society
PROJECT MANAGEMENT

Course Code: UMT 704      Credit Units: 03

Course Objective:
The course aims at making an understanding of the tools and the framework necessary to build a cohesive workflow plan that will help develop industry-standard process. Students will also learn project management skills specifically to all design and redesign projects, from the simplest to the most complex.

Course Contents:

Module I: Introduction
Conceiving a project, Strategic Management and Project Selection, Portfolio Management System.

Module II: Project Training
Conflict and Negotiation, Developing a project, Appraisal of project – financial, marketing appraisal, technology appraisal, managing the project, Project in Contemporary Organizations.

Module III: Project initiation
Project implementation – Scheduling, Resource Allocation, Monitoring and Information, Project Control

Module IV: Managing Risk
Risk Identification, Risk Assessment, Risk Response Development.

Module V: Project Termination
Project Auditing and Termination

Examination Scheme:

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Text & References:

Text:

References:
• Project Management: The Managerial Process, Clifford F. Gray and Erik W. Larson (Tata McGraw Hill)
STATISTICS FOR BIOLOGY

Course Code: UMT 705        Credit Units: 03

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

Course Contents:

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

Module II: Probability

Module III: Continuous Distribution
Normal Distribution, Properties of Normal distribution

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

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

Module VI: Introduction to the following Statistical terms
Parameter, Statistic, Null hypothesis, Alternative hypothesis, Critical region, Type1 Error, Type 11 Error, Level of significance, P-value and its applications.

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

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

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

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

Examination Scheme:

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Text & References:

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

References:
- Statistical Analysis, Kaushal, T.L. Publisher: Kalyani Publishers
- Statistical Methods, Potri, D. Kalyani Publishers.
AGRICULTURE BIOTECHNOLOGY

Course Code: UMT 706  Credit Units: 03

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

Course Contents:

Module I: Plant Tissue Culture
Sterilization; Nutrient medium; Callus & Suspension culture; micropropagation; production of virus free plant; anther, pollen and ovary culture for production of haploid plants and homozygous lines; embryo culture and embryo rescue; somaclonal variation; somatic hybridization in crop improvement; germplasm conservation.

Module II: Genetic engineering in plants
Direct and indirect method of plant cell transformation; Vectors with special reference to Ti plasmids, Selectable markers; Mechanism of T-DNA transfer to plants; Transgenic Plants: Gene Construct; Molecular maps and gene tagging; marker assisted selection.

Module III: Application of Transgene
Insect resistance; virus resistance; herbicide resistance; seed protein quality; transgene silencing; male sterility; molecular farming.

Module IV: Stress Tolerance Plant
Salt tolerance, freezing tolerances, drought tolerance; metal tolerance.

Module V
Plant patents; Plant variety certificates; Principle of crop production; safety regulation for transgenic plants.

Examination Scheme:

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Text & References:

Text:
- An Introduction to Plant Tissue Culture by M.K. Razdan. Publisher, Oxford and IBH Publishing
- Plant Biotechnology and Transgenic Plants by K.M.O. Caldenty, W.H. Barz and H.L. Wills. Publisher: Marcel Dekker

References:
- Plant Cell & Tissue Culture for the production of Food Ingredients by T-J Fu, G. Singh and W.R. Curtis. Publisher: Kluwer Academic/Plenum Press
- Plant Tissue Culture: Theory & Practice by S.S. Bhojwani and M.K. Razdan. Publisher: Elsevier Health Sciences
- Plant Biotechnology and Molecular Markers by P.S. Srivastava, A. Narula and S. Srivastava: Publisher-Anamaya, New Delhi
COMPUTER PROGRAMMING IN VB .NET  
(CONSOLE APPLICATION AND WINDOW FORMS)

Course Code: UMT 7067  Credit Units: 03

Course Objective:
The objective of this course is to make students well versed with concept and implementation of .NET technology into different type of application.

Course Contents:

Module I
Introduction to Visual Basic .NET and .NET framework, Variables and Constants Programming Constructs, Implement Arrays, Object – oriented features of Visual Basic.NET, Option statement, Typecasting, procedures and functions, delegates, Implement classes in VB.NET, events handling,

Module II
Properties, Polymorphism, Inheritance, Implement Method Overriding, Interfaces, Multithreading, collection, Implement error handling.

Module III
ADO.NET architecture, components of ADO.NET, Command and Connection Objects. Transactions in ADO.NET, use of Dataset, Data Adapter and Data Reader object. Use the Data Grid Control; List the properties and methods of the Data Grid Control. Data Bind in Data Grid, Insert, Update and Delete data in Data Grid Control.

Module IV
MDI and SDI applications, Menu Control, Dynamic Menu, Image List Control, Tool Bar and Status Bar Controls, Use the Timer Control, Tree View Control, List View Control.

Module V
Crystal Reports (Type of crystal report, Crystal Report Viewer, Work with Crystal Report Expert), Bind Crystal Reports to Windows Forms Applications, Help class and its components, Packaging and Deploying Concepts, Package Resources, Various Deployment Alternatives,

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Text & References:

**Text:**
- Visual basic.net Black book by Dreamtech Steven HolZner

**References:**
- Programming Visual Basic.NET 2003, Jesse Liberty and Orelly
- Mastering VB .net, BPB Publications
- Visual basic .net Black book by Dreamtech Steven HolZner
- VB.NET complete, BPB publication
- Visual Basic Step by Step, Microsoft
BIOSENSORS AND BIOELECTRONICS

Course Code: UMT 708      Credit Units: 03

Course Objective:
The course aims at making an understanding in students to be able to appreciate the basic configuration and distinction among biosensor systems, gain an understanding of general biosensor principles and terms, to be able to design, model, simulate, fabricate, and test a biosensor, gain an overall knowledge of biosensor types, applications, requirements, and capabilities to allow improved interaction with physicians, clinicians, and biomedical engineers, and to enable the student to conduct biomedical engineering research.

Course Contents:

Module I: Introduction
Introduction to Biosensors, Fundamental elements and engineering aspects of biosensor devices, Signal processing for biosensors and Bioselective Membranes, Biosensor Design considerations and applications

Module II: Electroanalytical Biosensors
Electrochemical principles, Conductance, Impedance Spectroscopy, Neural Recording Devices, Amperometric biosensors and charge transfer pathways in enzymes, Glucose biosensors, Potentiometric Sensors

Module III: Optical Biosensors
Optics for biosensors and Optical Spectroscopy for Biosensing, Attenuated total reflection systems, Optical Glucose Sensors, Fiber optic devices, fluorescence and evanescent wave guides, Surface Plasmon Resonance Devices (SPR), Chemiluminescence and Sensors, Optical Detectors: CCD, PMT, photodiodes, etc

Module IV: Other Biosensors

Examination Scheme:

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Text & References:

Text:
- Biosensors by Minh Canh. Tran.
- Biosensors: Theory and Applications by Donald G. Buerk.

References:
- Biosensors in Environmental Monitoring - by Ursula Bilitewski, Anthony P. F. Turner.
- Biosensors: Microelectrochemical Devices - by Marc J. C. Lambrechts.
- Biosensors with Fiberoptics - by Donald Lee Wise, Lemuel B. Wingard.
- Biosensors and Their Applications - by That Tien Ngo, Victor Chi-Min Yang.
- Thermal Biosensors, Bioactivity, Bioaffinity -by Prakash K. Bhatia.
- Novel Approaches in Biosensors and Rapid Diagnostic Assays - by Zvi Liron, Avraham Bromberg, Morly Fisher.
**COMPUTATIONAL BIOLOGY LAB - II**

**Course Code:** UMT 720  
**Credit Units:** 01

**Course Objective:**  
The objective is to generate phylogenetic tree from molecular data, to predict and characterize the protein structures.

**Course Contents:**

**Module I**  
Motif and pattern searching, Phylogenetic prediction and analysis

**Module II**  
Cn3D, Deepview and Whatif, Demonstration of Tripos, Insight II

**Module III**  
Structure prediction, Protein structure classification resources

**Module IV**  
Structure superposition tools, Energy minimization and Simulated annealing, Docking small molecules/peptides in active site of protein, Use of automated docking procedures, Free energy calculation.

**Module V**  
Finding transcription regulatory signals

**Examination Scheme:**

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**Note:** Minor variation could be there depending on the examiner.
Course Objective:
The present course aims to acquaint the students with lab-scale cultivation of microbes for production of industrially important products with the concept of scale up processes.

Course Contents:

Module I
Isolation of industrially important micro organisms for microbial processes.

Module II
Determination of Thermal Death Point and Thermal death time of micro organisms.

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

Module IV
Comparative studies of ethanol production using different substrates.

Module V
Production and estimation of protease

Module VI
Sauer Kraut fermentation

Module VII
Cell immobilization by Ca-alginate entrapment method.

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Course Code: UMT 722  
Credit Units: 02

Course Objective:
The laboratory will help the students to extract different bioproducts during their characterization since any of these products may be of biotechnological importance. They can be exploited in exploring the future biotechnology.

Course Contents:

Module I
Conventional filtration and membrane based filtration

Module II
Protein precipitation and recovery

Module III
Aqueous two-phase separation

Module IV
Ion exchange chromatography

Module V
Gel Permeation chromatography

Module VI
Electrophoresis

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Note: Minor variation could be there depending on the examiner.
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 magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes
Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.
a) Get facts, not just opinions. Compare the facts with author's conclusion.
b) In research studies, notice the methods and procedures, results & conclusions.
c) Check cross references.

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

5. Writing the first draft
Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:
a) statement of purpose
b) main body of the paper
c) statement of summary and conclusion
Avoid short, bumpy sentences and long straggling sentences with more than one main 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
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:

1. summary of question posed
2. summary of findings
3. summary of main limitations of the study at hand
4. details of possibilities for related future research

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

**Bibliographical conventions**

**Monographs**

**Edited volumes**

**Edited articles**

**Journal articles**

**Electronic book**

**Electronic journal articles**

**Other websites**

**Unpublished paper**
Unpublished theses/ dissertations

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

Assessment Scheme:

Continuous Evaluation: 40%
(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

Final Evaluation: 60%
(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)
COMMUNICATION SKILLS - V

Course Code: UMT 741      Credit Units: 01

Course Objective:
To facilitate the learner with Academic Language Proficiency and make them effective users of functional language to excel in their profession.

Course Contents:

Module I
Introduction to Public Speaking
Business Conversation
Effective Public Speaking
Art of Persuasion

Module II: Speaking for Employment
Types of Interview
Styles of Interview
Facing Interviews-Fundamentals and Practice Session
Conducting Interviews- Fundamentals and Practice Session
Question Answer on Various Dimensions

Module III
Resume Writing
Covering Letters
Interview Follow Up Letters

Module IV: Basic Telephony Skills
Guidelines for Making a Call
Guidelines for Answering a Call

Module V: Work Place Speaking
Negotiations
Participation in Meetings
Keynote Speeches

Examination Scheme:

<table>
<thead>
<tr>
<th>Components</th>
<th>CT1</th>
<th>CT2</th>
<th>CAF</th>
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</tbody>
</table>

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

Text & References:

- Krishnaswamy, N, Creative English for Communication, Macmillan.
- Taylor, Conversation in Practice.
Course Objective:
This course aims at enabling students towards:
- Understand the importance of individual differences.
- Better understanding of self in relation to society and nation.
- Facilitation for a meaningful existence and adjustment in society.
- Inculcating patriotism and national pride.

Course Contents:

Module I: Individual differences & Personality
- Personality: Definition & Relevance.
- Importance of nature & nurture in Personality Development.
- Importance and Recognition of Individual differences in Personality.
- Accepting and Managing Individual differences.
- Intuition, Judgment, Perception & Sensation (MBTI).
- BIG5 Factors.

Module II: Managing Diversity
- Defining Diversity
- Affirmation Action and Managing Diversity
- Increasing Diversity in Work Force
- Barriers and Challenges in Managing Diversity

Module III: Socialization
- Nature of Socialization
- Social Interaction
- Interaction of Socialization Process
- Contributions to Society and Nation

Module IV: Patriotism and National Pride
- Sense of pride and patriotism
- Importance of discipline and hard work
- Integrity and accountability

Module V: Human Rights, Values and Ethics
- Meaning and Importance of human rights
- Human rights awareness
- Values and Ethics - 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:
- Davis, K. Organizational Behaviour.
- Dressler, David and Cans, Donald: The Study of Human Interaction.
- Robbins O.B. Stephen; Organizational Behaviour.
Course Objective:
Revise the portion covered in the first volume, give proper orientation in communication and culture.

Course Contents:

Module A: Unités 1 – 3: pp. 06 - 46

Contenu lexical:

Unité 1: Rédiger et présenter son curriculum vitae
- Exprimer une opinion
- Caractériser, mettre en valeur
- Parler des rencontres, des lieux, des gens

Unité 2: Imaginer - Faire des projets
- Proposer - conseiller
- Parler des qualités et des défauts
- Faire une demande écrite
- Raconter une anecdote
- Améliorer son image

Unité 3: Exprimer la volonté et l’obligation
- Formuler des souhaits
- Exprimer un manque/un besoin
- Parler de l’environnement, des animaux, des catastrophes naturelles

Contenu grammatical:

1. Le passé : passé composé/imparfait
2. Pronoms compléments directs/indirects, y/en (idées/chooses)
3. Propositions relatives introduites par qui, que, où
4. Comparatif et superlatif
5. Le conditionnel présent
6. Situer dans le temps
7. Féminin des adjectifs
8. La prise de paroles : expressions
9. Le subjonctif : volonté, obligation

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & Références:

- le livre à suivre : Campus: Tome 2
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 Advanced Grammar and Business Language and Professional Jargon.

Course Contents:

Module I: Dass- Sätze
Explain the use of the conjunction “-that”, where verb comes at the end of the sentence

Module II: Indirekte Fragesätze
To explain the usage of the “Question Pronoun” as the Relative Pronoun in a Relative Sentence, where again the verb falls in the last place in that sentence.

Module III: Wenn- Sätze
Equivalent to the conditional “If-” sentence in English. Explain that the verb comes at the end of the sentence.

Module IV: Weil- Sätze
Explain the use of the conjunction “because-” and also tell that the verb falls in the last place in the sentence.

Module V: Comprehension texts
Reading and comprehending various texts to consolidate the usage of the constructions learnt so far in this semester.

Module VI: Picture Description
Firstly recognize the persons or things in the picture and identify the situation depicted in the picture; secondly answer questions of general meaning in context to the picture and also talk about the personal experiences which come to your mind upon seeing the picture.

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 Code: UMT 746      Credit Units: 02

Course Objective:
To enable students acquire working knowledge of the language; to give them vocabulary, grammar, expressions
used on telephonic conversation and other situations to handle everyday Spanish situations with ease.

Course Contents:

Module I
Revision of earlier semester modules

Module II
Zodiac signs. More adjectives…to describe situations, state of minds, surroundings, people and places.

Module III
Various expressions used on telephonic conversation (formal and informal)

Module IV
Being able to read newspaper headlines and extracts (Material to be provided by teacher)

Module V
Negative commands (AR ending verbs)

Module VI
Revision of earlier sessions and introduction to negative ER ending commands, introduction to negative IR
ending verbs

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Español En Directo I A, 1B
- Español Sin Fronteras
- Material provided by the teacher from various sources
Course Objectives:
To enable the students to converse in the language with the help of different speech, possibilities, probabilities etc.

Note: The teaching is done in roman as well as Japanese script. 10 more kanjis (Japanese characters) are taught in this semester.

Course Contents:

Module I: Thought
Expressing one’s thought and intentions on different situations.

Module II: Advice
Giving advice, probability, possibility and suggestions.

Module III: Informal Speech
Addressing friends and close people using informal ways.

Module IV: Simultaneous Verbs
Describing two situations simultaneously.

Module V: Possibility
Explaining the probability and possibility of any situation.

Learning Outcome
➢ Students can interact in a formal as well as informal way on above-mentioned topics.

Methods of Private study/ Self help
➢ Hand-outs, audio-aids, assignments and role-plays will support classroom teaching.

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Shin Nihon-go no Kiso Lesson No.-31 to 35.
- All vocabulary and topics taught to the students are from the above mentioned book.
Course Objective:
The story of Cinderella first appears in a Chinese book written between 850 and 860 A.D. 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.
About china part –I Lesson 1, 2.

Module II
Pronunciation and intonation
Character Writing and stroke order.

Module III
Ask someone what he/she usually does on weekends?
Visiting people, Party, Meeting, After work….etc.

Module IV
Conversation practice
Translation from to Chinese and vise-versa.
Short fables.

Module V
A brief summary of grammar.
The optative verb “yuanyi”.
The pronoun “ziji”.

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

• “Kan tu shuo hua” Part-I Lesson 1-7
PHARMACEUTICAL TECHNOLOGY

Course Code: UMT 801
Credit Units: 05

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

Course Contents:

Module I
Introduction to Physical Pharmaceutics - Metrology and Calculations,

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

Module III
Polymer Science and Applications, Formulations and Development, Packaging

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

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

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

Examination Scheme:

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Text & References:

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

References:
- Physical Pharmacy by Alfred Martin.
- Cooper and Gunn's Tutorial Pharmacy.
ENVIRONMENTAL BIOTECHNOLOGY

Course Code: UMT 802        Credit Units: 05

Course Objective:
To introduce the students to regenerate clean environment using biotechnology as the key tool and provide them the insight for eco-friendly approach along with the concept of sustainable development.

Course Contents:

Module I
Environmental components, Natural resources, Ecosystem and its diversity, Environmental pollution and its major impacts, Global warming and greenhouse effect, Global Ozone Problem, Acid rain, Eutrophication, Land degradation, Biomagnification.

Module II
Non-renewable and renewable energy resources, concept of clean fuel technology, Biomass energy and biofuels.

Module III
Biodegradation and bioremediation of major pollutants, Biomineralisation: Use of microbial technology for mining.

Module IV: Waste water engineering
Treatment of municipal wastes and industrial effluents with special focus on use of biological methods, Advanced waste water treatments

Module V: Bioassessment of environmental quality
Biosensors and biomarkers, Biofertilizers, Biopesticides and Vermi composting

Module VI
Environmental impact assessment and Environmental audit, Related case studies from Indian market

Examination Scheme:

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Text & References:

Text:
- Environmental Science, S.C. Santra.
- Environmental Biotechnology, Pradipta Kumar Mohapatra.

References:
- Environmental Biotechnology – Concepts and Applications” by Hans-Joachim Jordening and Jesef Winter.
- Introduction to Environmental Biotechnology by Milton Wainwright.
- Principles of Environmental Engineering by Gilbert Masters.
GENOMICS AND PROTEOMICS

Course Code: UMT 803      Credit Units: 05

Course Objective:
The course helps in developing a detailed understanding of eukaryotic genome complexity and organization. Current research on the molecular basis of the control of gene expression in eukaryotic system has developed a detailed understanding of techniques of gene diagnostics and DNA profile to acquire the fundamentals of genomics and Proteomics.

Course Contents:

Module I: Genome evolution and phylogenetics
Origin of genomes, Acquisition of new genes, DNA sequencing – chemical and enzymatic methods, The origins of introns, DNA and RNA fingerprinting, The human genome.

Module II: Structural Genomics
Technology, Sequences Comparison Techniques [BLAST, Genome, Annotation.

Module III: Comparative Genomics
Phylogeny, COGS [Cluster of orthologues genes], paralogues and gene displacement, Metabolic Reconstruction, The Basic Principles and Methodology.

Module IV: Functional Genomics
ESTs, Digital Northerns, SAGE, Relational Data Base Basics, cDNA Microarrays, Oligonucleotide Microarray Chips, Cancer and genomic microarrays, Application of Microarrays with examples, Microarray Data Analysis; Gene finding tools

Module V: Genotyping Background and SNPs
SNPs II and TOGA, AFLP and RFLP analysis, Arabidopsis KO Strategies; Pharmacogenomics; Ethical considerations of genetic testing. Introduction to proteomics; protein function and expression; essential proteins; Protein function from structure; Rational drug design; Lethal mutants.

Module VI: Introduction to proteomics
How to analyze a Proteome – 2D-gel electrophoresis, high-throughput proteome analysis with 2D-IEF, Current concepts of co-immunoprecipitation for protein interaction analysis, chromatography, amino acid sequencing, Current concepts of peptide sequencing with MS-MS methods, MALDI-TOF mass spectrometry and nanospray MS, Phage Display, Protein chips; Two-hybrid methods, Synthetic lethal screens, Proteome-wide interaction maps, TAP tags, GFP tags, Syntethic Lethal Screens.

Module VII: Protein Structure and Function
Structure function relationship, Protein-protein interactions – Large molecular complexes – RNA polymerase II, ribosome; Unstructured proteins – Current concepts and examples, the fly-casting mechanism; Current Degradation Concept, The N-end rule and PEST sequences, control of ubiquitination, the proteasome, SUMO Protein-protein interactions in health and disease; Molecular mechanisms in disease, Structure determination of proteins– experimental and theoretical methods, Metabolic networks – Metabolic pathways, Metabolic regulation, Genome-Proteome Connection, DNA microarrays and Analysis of metabolic control.

Examination Scheme:

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Text & References:

Text:
- Bioinformatics: From Genomes to Drugs, T. Lengauer, John Wiley and Sons Inc.

References:
- Bioinformatics: Sequence and Genome Analysis, D.W. Mount, Cold Spring Harbor Laboratory Press
- Genomes II, T.A. Brown
- Biotechnology and Genomics by P.K. Gupt
Course Objective:
This course will provide a broad grounding in concepts, techniques and issues involved in food products and their processing.

Course Contents:

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

Module II: Techniques used in Food Industry
Sterilization, isolation, screening and strain improvement, cell harvesting and disruption, recovery and purification, production of organic acids – citric acid, lactic acid and acetic acid; Gene cloning, production of recombinant proteins e.g. chymosin

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

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

Examination Scheme:

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Text & References:

Text:

References:
BIOIMAGING AND BIOPHOTONICS

Course Code: UMT 805        Credit Units: 04

Course Objective:
Biophotonics is the science of generating and harnessing light (photons) to image, detect and manipulate biological materials. The goal of this course is to provide an introduction to the principles of optics and lasers, the basics of biology, the interaction of light with cells and tissues, and the applications of various optical imaging and sensing techniques in biomedicine.

Course Contents:

Module I

Module II

Module III: Bioimaging
Principles of Optical Microscopy Principles, techniques and applications- Cellular, Tissue and In Vivo Imaging.

Module IV
Fluorescence Microscopy, Confocal Microscopy; Diffusion Optical Tomography, Multiphoton Microscopy; Nonlinear Optical Imaging, Optical Coherence Tomography MEMS and MEMS-Based Bioimaging.

Module V: Optical biosensors

Examination Scheme:

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Text & References:

Text:

References:
**COMPUTER PROGRAMMING IN BIO-PERL**

Course Code: UMT 806
Credit Units: 04

Course Objective:
This course will give an introduction to Perl and BioPerl and their application in bioinformatics and an convenient way to handling the complex data produced by experiments using the technology.

Course Contents:

**Module I**
An Introduction to Perl, Perl basics-Data Types and Operators, Basic Perl Data structures, Perl Build-in Functions.

**Module II**
Control Structure, Pattern Matching and Regular Expressions, Input/Output in Perl.

**Module III**
Custom Functions, References and Anonymous Data Structures, Debugging in Perl.

**Module IV**

**Module V**

**Module VI**

Examination Scheme:

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Text & References:

**Text:**
- Mastering Perl for Bioinformatics James D. Tisdall, O’Reilly

**References:**
- Genomic Perl by Rex A. Dwyer
- Beginning Perl for Bioinformatics James D. Tisdall, O’Reilly
Course Code: UMT 820      Credit Units: 02

Course Objective:
The present course develops the practical understanding of bioremediation of different polluted components of environment. The present course will make them competent academically to envisage the different problems.

Course Contents:

Module I
Air Quality: Sampling, SPM determination using filter paper method.

Module II: Water Quality
Chemical analysis of water; Biological analysis of water: Total microbial count, Coliform test, BOD, COD

Module III: Soil analysis
Chemical and microbial characterization of contaminated soil, isolation of microbes from contaminated soil and to test their bioremediation efficiency.

Module IV
Vermicomposting

Module V
Production of Biofertilisers.

Examination Scheme:

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Note: Minor variation could be there depending on the examiner.
GENOMICS AND PROTEOMICS LAB

Course Code: UMT 821 Credit Units: 03

Course Contents:

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

Module II
DNA sequencing methods.

Module III
Gene finding tools and Genome annotation.

Module IV
Comparison of two given genomes.

Module V
Analysis of 2D – IEF data

Module VI
Microarray and Microarray data analysis

Module VII
Inference of protein function from structure

Module VIII
Phage display

Module IX
Two-hybrid methods

Examination Scheme:

<table>
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<tr>
<th>IA</th>
<th>EE</th>
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<tr>
<td>Class Test (Practical Based)</td>
<td>Mid Term Viva</td>
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Note: Minor variation could be there depending on the examiner.
TERM PAPER – III

Course Code: UMT 830 Credit Units: 04

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

Choosing a Subject
The subject chosen should not be too general.

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

3. Collecting the notes
   Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.
   a) Get facts, not just opinions. Compare the facts with author's conclusion.
   b) In research studies, notice the methods and procedures, results & conclusions.
   c) Check cross references.

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

5. Writing the first draft
   Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is.
   You may follow the following:
   a) statement of purpose
   b) main body of the paper
   c) statement of summary and conclusion
   Avoid short, bumpy sentences and long straggling sentences with more than one main 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
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:
1. summary of question posed
2. summary of findings
3. summary of main limitations of the study at hand
4. details of possibilities for related future research

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

**Bibliographical conventions**

**Monographs**

**Edited volumes**

**Edited articles**

**Journal articles**

**Electronic book**

**Electronic journal articles**

**Other websites**

**Unpublished papers**
Unpublished theses/dissertations

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

Assessment Scheme:

Continuous Evaluation: 40%
(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

Final Evaluation: 60%
(Based on the organization of the paper, objectives/problem profile/issue outlining, comprehensiveness of the research, flow of the idea/ideas, relevance of material used/presented, outcomes vs. objectives, presentation/viva etc.)
COMMUNICATION SKILLS - VI

Course Objective:
The modules are designed to enhance the communicative competence of the learners to equip them with efficient interpersonal communication.

Course Contents:

Module I: Dynamics of Group Discussion
Introduction,
Methodology
Role Functions
Mannerism
Guidelines

Module II: Communication through Electronic Channels
Introduction
Technology based Communication Tools
Video Conferencing
Web Conferencing
Selection of the Effective Tool
E-mails, Fax etc.

Module III: Effective Public Speaking
Types
Essentials
Success in Public Speaking
Dos and Don’ts

Examination Scheme:

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<th>Components</th>
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</table>

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

Text & References:

- Krishnaswamy, N, Creative English for Communication, Macmillan.
- Taylor, Conversation in Practice.
Course Code: UMT 843      Credit Units: 01

Course Objective:
- To have a great deal of insight into one’s character.
- Understanding of positive emotions
- To explore the dimensions of happiness, well-being, Optimism and hope
- Quick understanding of different situations and grasp new concepts.

Course Contents:

Module I: Positivity in personality
Importance of Positivity in personality
Positivity Vs Negativity
Introspection and personal growth

Module II: Positive Emotions
Understanding positive emotions
Importance of Positive emotion
Types and identification of positive emotions (Love, happiness, Contentment, Resilience, etc.)

Module III: Hope, Optimism and Resilience
Positive approach towards future
Benefits of Positive approach
Resilience during challenge and loss

Module IV: Application of Positive Emotions
Application of positive emotions in relationships, and organizations
Creating healthy organizational climate
Positive emotions enhances performance

Module V: Happiness and Well Being
Concept of Happiness & Well-Being
Secret of happy mind and healthy life
Work life balance

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

Text & References:
Course Objective: 
Provide students with the necessary linguistic tools
- to face up to different situations of communication
- to enhance their capacity in oral/written comprehension/expression

Course Contents:

Module B: Unités 4, 5, 6: PP. 48 - 86

Contenu lexical:

Unité 4: 1. Présenter une information/les circonstances d’un événement
2. Exprimer la possibilité/la probabilité
3. Exprimer une quantité indéfinie
4. Comprendre et raconter un fait div

Unité 5: 1. Parler d’une passion, d’une aventure
2. Choisir/ créer
3. Exprimer la surprise/des sentiments

Unité 6: 1. Exprimer la cause et la conséquence
2. Exprimer la crainte et rassurer
3. Faire une démonstration

Contenu grammatical:

1. la construction passive
2. la forme impersonnelle
3. l’interrogation
4. les adjectifs et les pronoms indéfinis
5. les pronoms interrogatifs et démonstratifs
6. la construction avec deux pronoms
7. le subjonctif dans l’expression des sentiments, de la crainte, du but
8. constructions permettant l’expression de la cause et de la conséquence
9. l’enchaînement des idées : succession et opposition

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & Références:

- le livre à suivre : Campus: Tome 2
GERMAN - VIII

Course Code: UMT 845 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
Introduction to Advanced Grammar and Business Language and Professional Jargon

Course Contents:

Module I: Reading and comprehension
Reading texts and comprehending them

Module II: Information about German History
Acquiring information about German History through appropriate texts and stories

Module III: Bio data/Curriculum vitae
Writing a bio-data in the proper format with all essential components

Module IV: Informal letters
Reading and writing informal letters

Module V: Business etiquette
Business etiquette in Germany and types of companies

Module VI: Interview skills
To learn to face interviews
Read a text ‘Interviewspiel’

Module VII: Picture Description
Firstly recognize the persons or things in the picture and identify the situation depicted in the picture; Secondly answer questions of general meaning in context to the picture and also talk about the personal experiences which come to your mind upon seeing the picture.

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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 to deal with Spanish situations putting things in perspective, using Past Tense. Enabling them to comprehend and form slightly complex sentences. Give students vocabulary of various situations.

Course Contents:

Module I
Situational exercises/Picture Description:
At the cine
At the Chemist’s/Hospital

Module II
At a corporate client’s informal/formal meeting/gathering
Looking for accommodation

Module III
Past Tense (Indefinido) of regular verbs
Past Tense (Indefinido) of irregular verbs
Exercises related to the above

Module IV
Past Tense (Imperfecto)

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Español En Directo I A, 1B.
- Español Sin Fronteras.
- Material provided by the teacher from various sources.
Course Code: UMT 847
Credit Units: 02

Course Objective:
To enable the students to converse in the language with the help of different forms as volitional forms, active and passive voice and decision making etc.
Note: The course and teaching in Roman as well as Japanese script. Also introducing next 10 to 20 kanjis.

Course Contents:

Module I: Volitional forms
Explaining the situation when one is thinking of doing something.

Module II: Active and Passive voice
Direct and indirect ways of speech.

Module III: Plain Forms
Sentence patterns using plain forms of verb.

Module IV: Causes and effects
Explaining causes and effects with different forms of verb.

Module V: Decision making
Expressing different occupations and how to make decision.

Learning Outcome
➢ Students can speak the language and will be able to express their views and opinions comfortably.

Methods of Private study/ Self help
➢ Hand-outs, audio-aids, assignments and role-plays will support classroom teaching.

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

• Shin Nihon-go no Kiso Lesson No.-36 to 40.
• All vocabulary and topics taught to the students are from the above mentioned book.
Course Objective:
Paper was first invented in China in 105 AD. It was a closely guarded secret and didn’t reach Europe until the 8th Century. 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.
The aspect particle “le” and the modal particle “le”.

Module II
Optative verbs
Texts based on different topics
Enriching vocabulary by dealing with various daily scenarios and situations.

Module III
Sentences with subject predicate construction as its predicate
Pronunciation and intonation
Character writing and stroke order

Module IV
About china Part I Lesson 2,3
Chinese to English and English to Chinese translations from the news paper.

Module V
Questions with an interrogative pronoun
Essays, writing formal letters.
Conversation practice.

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

ADVANCES IN STEM CELL AND GENE THERAPY

Course Code: UMT 901       Credit Units: 04

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

Course Contents:

Module I
Introduction to Gene Therapy, History and evolution of Gene therapy, optimal disease targets, Failures and successes with gene therapy and future prospects

Module II: Gene Delivery
Adenoviral Vectors, Adeno-associated virus (AAV) Vectors, Non-viral Vectors and Physical Methods, Retroviral and Lentiviral Vectors, Herpes Virus Vectors & Combinatorial methods, Gene transfer methods

Module III
Innate and Acquired Immune Response to Cell and Gene Therapy, Gene Therapy and the Immune System: Genetic Immunization

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

Module V
Cell, Disease, and Genetic Perspectives for Gene Therapy, Cell and Gene Therapy of the Nervous System, Cancer Gene Therapy, Cell and Gene Therapy for Vascular Disorders, Bone marrow transplants, Cancer Gene Therapy, Immunotherapy, Autoimmune Diseases and the Promise of Stem Cell-Based Therapies, Stem Cells and Diabetes, Stem Cells and heart Repair

Module VI

Examination Scheme:

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Text & References:

Text:
- Stem Cell and Gene-Based Therapy: Frontiers in Regenerative Medicine, Alexander Battler, Jonathan Leo, Springer,

References:
- Stem Cell Biology and Gene Therapy, Quesenberry PJ, Stein GS, eds. (£65.00.) Wiley, 1998.
- Progress in gene therapy, Volume 2,Pioneering stem cell/gene therapy trials, Roger Bertolotti, Keiya Ozawa and H. Kirk Hammond, VSP international science publishers
- Stem Cells Handbook: Stewart Sell, Humana Press; Totowa NJ, USA; Oct. 2003,
- Understanding Biotechnology by Aluízio Borém, Fabrício R. Santos, David E. Bowen, Prentice Hall
- Cell Therapy: Stem Cell Transplantation, Gene Therapy, and Cellular Immunotherapy (Cancer: Clinical Science in Practice) George Morstyn, William Sheridan, Cambridge University Press,
Course Code: UMT 902 Credit Units: 04

Course Objective:
To evolve a detail understanding into the application 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:

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Text & References:

Text:

References:
- Bioelectronics: From Theory to Applications Willner, Itamar / Katz, Eugenii (eds.) Wiley-VCH, 2005
- Analytical Electrochemistry, by Joseph Wang
BIOPROCESS PLANT DESIGN

Course Code: UMT 903      Credit Units: 04

Course Objective:
The objective of this paper is to include the application of chemical engineering principles/unit operations to bioprocess systems and the principles of disciplines of mechanical, electrical and industrial engineering to design a completely economically optimal process using living or subcomponent of cells.

Course Contents:

Module I
Introduction; general design information; Mass and energy balance.

Module II
Flow sheeting; Piping and instrumentation; Materials of construction for bioprocess plants; Mechanical design of process equipment.

Module III
Vessels for biotechnology application; Design of fermenters; Design considerations for maintaining sterility of process streams processing equipment.

Module IV
Selection and specification of equipment for handling fluids and solids; Selection, specification, design of heat and mass transfer equipment used in bioprocess industries.

Module V
Design of facilities for cleaning of process equipment used in biochemical industries.

Module VI
Utilities of biotechnology production plants; Process economics; Bioprocess validation; Safety considerations; Case studies.

Examination Scheme:

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Text & References:

Text:

References:
- Chemical Engineers Handbook by R.H. Perry and D.W. Green, McGraw-Hill
- Manufacturing Facilities Design and Material Handling by F.E. Meyers and M.P. Stephens, Prentice Hall
- Plant Design and Economics for Chemical Engineers by M. Peters and K. Timmerhaus, McGraw-Hill
- Process Plant Layout and Piping Design by E. Bausbacher and R. Hunt, Prentice Hall PTR.
Course Objective:
The course will be aimed to identify and design drugs that could be potentially useful in the identification of the candidate drugs, which have efficacy in cell culture or animal models, and thus the most effective compounds could be employed based on the above results for being moved through preclinical studies to clinical trials.

Course Contents:

Module I: Drug targets classification
DNA, RNA, post-translational, processing enzymes, metabolic enzymes involved in nucleic acid synthesis, G-protein coupled receptors, small molecule receptors, neuropeptide receptors, ion channels proteins, ligand-gated ion channels, transporters.

Module II: Drug Targets and Structure-based design
Drug targets classification, Genomics (new target discovery), biological activity directed and other types of screening, natural products, combinatorial chemistry; General overview modeling methodologies, structure based drug design, 'de novo' design methodologies: indirect drug design, pharmacophore development and receptor mapping, 3D-database searching techniques, new strategies and recent technologies in drug design.

Module III: Design, development of combinatorial libraries and QSAR
The molecular diversity problem, drug characterization, QSAR, classical QSAR, molecular descriptors 3D QSAR and COMFA, drug design to discovery and development, drug metabolism, toxicity and pharmacokinetics, toxicology considerations, problems and drawbacks on drug discovery and development.

Module IV: Basic concepts of Drug Delivery

Module V: Drug administration
Parenteral delivery, Oral delivery and systemic delivery, Nasal and pulmonary delivery, Ophthalmic delivery, Drug targeting to CNS, Delivery of Genetic material, Viral and nonviral vectors in gene delivery
New generation technologies in Drug delivery and targeting

Examination Scheme:

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Text & References:

Text:
- Drug Delivery and Targeting, A.M. Hillery, A.W. Lloyd and J. Swarbrick, Harwood Academic Publisher

References:
- Principles of Medicinal Chemistry, W.O. Foye, T.L. Lemke, and D.A. Williams, Williams and Wilkins
- Side Effects and Drug Design, E.J. Lien, Marcel Dekker
- Introduction to Biophysical Methods for Protein and Nucleic Acid Research, J.A. Glasel and M.P. Deutscher, Academic Press
- Drug Delivery: Engineering Principles for Drug Therapy (Topics in Chemical Engineering), W.M. Saltzman, Oxford University Press
- Handbook of Biodegradable Polymers (Drug Targeting and Delivery), A.J. Domb, J. Kost and D.M. Wiseman, Dunitz Martin Ltd.
- Pharmaceutical Dosage Forms and Drug Delivery Systems, H.C. Ansel, L.V. allen and N.G. Popovich, Lippincott Williams and Wilkins Publisher
TISSUE ENGINEERING

Course Code: UMT 905      Credit Units: 04

Course Objective:
This course will cover topics related to the design and functional assessment of bioengineered tissue substitutes. Strategies for engineering tissues with a load-bearing function will be of particular focus. Strategies to study cell-surface and cell-cell interactions to physical stimuli, bioreactors, biological scaffolds and 3D cell-tissue constructs will be explored through recent papers.

Course Contents:

Module I: Fundamentals of tissue engineering
Basic definition, History, Concepts and overview, Principles and components, current scope of development; use in therapeutics and in vitro testing

Module II: Engineering materials
Scaffolds: Functions, Types (ECM-like Scaffolds, Tissue-Derived Scaffolds, Fibrin Gel, Natural Sponge; Injectable Scaffolds, Elastic Scaffolds, Inorganic Scaffolds Composite Scaffolds). Biomaterials: properties, cellular adhesion, surface modifications. Polymers (Natural such as Protein and Polysaccharides; Synthetic such as Poly(α-hydroxyacids, Hydrogels and Polyurethanes), Composite.

Module III: Cell Sources:
Fundamental properties of cells, autologous, allogeneic, syngeneic, and xenogeneic cells, and genetically engineered cells, Stem and progenitor cells. Cell Extraction, Biomolecules /synthetic ECM: Growth Factors (Representative Growth factors), Delivery of Growth factors

Module IV: Tissue Culture & Engineering Design Aspects

Module V: Case Studies

Examination Scheme:

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Text & References:

Text:
- Frontiers in Tissue Engineering (ISBN 0080426891), Patrick, Mikos, McIntire, Pergamon

References:
- Tissue Engineering: Engineering Principles for the Design of Replacement Organs and Tissues By W. Mark Saltzman; Published Oxford University Press US, 2004, pp 523
- Tissue engineering Fundamentals and Applications By Yoshito Ikada, Published Elsevier, 2006, pp 469
ADVANCED BIOENERGY ENGINEERING

Course Code: UMT 906      Credit Units: 04

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

Course Contents:

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

Module II: Biogas Technology

Module III: Bio-Ethanol and Bio-Diesel Technology
Production of Fuel Ethanol by Fermentation of Sugars. Gasohol as a Substitute for Leaded Petrol. - Trans-esterification of Oils to Produce Bio-Diesel.

Module IV: Pyrolysis and Gasification of Biomass

Module V: Combustion of Biomass and Cogeneration Systems

Examination Scheme:

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Text & References:

Text:

References:
COMPUTER PROGRAMMING IN JAVA

Course Code: UMT 907      Credit Units: 04

Course Objective:
The objective is to introduce students to a modern programming language and help them gain sufficient fluency to undertake research projects with a programming component; to lay the foundations for more advanced study of object-oriented languages. Emphasis is on to understand the basic concepts of programming and new areas of biological programming; to learn the syntax and semantics of Java and BioJava; to be able to use a program development environment.

Course Contents:

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

Module II
JDBC- Introduction to Client Server Application, Java Drivers, java.sql Package, Executing SQL Statements

Module III
Java Servlets- Introduction to Server Side Application Development, Basics of Servlet Programming

Module IV
JSP - Java Server Pages, JSP and Servlets (Differences and Similarity), JSP details - directives, scriplets, expressions, JSP tags

Module V
Installation of Bio-Java, Application of Bio-Java Computational biology, concept and programming with BioJava.

Examination Scheme:

<table>
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<th>Assignment/Project/Seminar/Quiz</th>
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<td>70</td>
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</table>

Text & References:

Text:
- Complete reference by Herbert Schildt TataMcGraw Hill

References:
- Programming with java A Primer by Balagurusamy Publisher: TataMcGraw Hill
- The complete Guide to java by Siple.TataMcGraw Hill
Course Objective:
The course will be aimed to identify and design drugs that could be potentially useful in the identification of the candidate drugs, which have efficacy in cell culture or animal models, and thus the most effective compounds could be employed based on the above results for being moved through preclinical studies to clinical trials.

Course Contents:

Module I
Ab initio structure prediction, Fold family recognition, Homology modeling.

Module II: Drug Designing
Building Biological Molecules, Conformational Search Techniques.

Module III: Target Structure Based Drug Design
Active site identification, Characterization of target site, Docking, Analysis

Module IV: QSAR (Quantitative Structural Activity Relationship, 2D QSAR, 3D QSAR; Analysis, Abinitio drug design

Examination Scheme:

<table>
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<th>IA</th>
<th>EE</th>
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<tbody>
<tr>
<td>Class Test (Practical Based)</td>
<td>Mid Term Viva</td>
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</table>

Note: Minor variation could be there depending on the examiner.
TERM PAPER - IV

Course Code: UMT 930 Credit Units: 03

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 magazines articles, news stories, periodicals, scientific journals etc.

3. Collecting the notes
Skim through sources, locating the useful material, then make good notes of it, including quotes and information for footnotes.
   a) Get facts, not just opinions. Compare the facts with author's conclusion.
   b) In research studies, notice the methods and procedures, results & conclusions.
   c) Check cross references.

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

5. Writing the first draft
Write the paper around the outline, being sure that you indicate in the first part of the paper what its purpose is. You may follow the following:
   a) statement of purpose
   b) main body of the paper
   c) statement of summary and conclusion
Avoid short, bumpy sentences and long straggling sentences with more than one main 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
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:

1. summary of question posed
2. summary of findings
3. summary of main limitations of the study at hand
4. details of possibilities for related future research

**Bibliography**

From the very beginning of a research project, you should be careful to note all details of articles gathered. The bibliography should contain ALL references included in the paper. References not included in the text in any form should NOT be included in the bibliography.

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

**Bibliographical conventions:**

**Monographs**


**Edited volumes**


[(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**


**Unpublished theses/dissertations**


**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%
COMMUNICATION SKILLS - VII

Course Code: UMT 941
Credit Units: 01

Course Objective:
One cannot communicate’. This course is designed to facilitate our young Amitians to communicate effectively by emphasizing on practical communication through refurbishing their existing language skills and also to bring one and all to a common take-off level.

Course Contents:

Module I: Fundamentals of communication
Relevance of communication
Effective communication
Models of communication
Effective use of language

Module II: Tools of communication
Proficiency in English – The international Language of business
Building vocabulary
(Denotative & connotative)
Extensive vocabulary drills
(Synonyms / Antonyms / Homonyms)
One Word substitution
Idioms & phrases
Mechanics and Semantics of sentences
Writing sentences that really communicate
(Brevity, Clarity, and Simplicity)
Improving the tone and style of sentences

Module III: Barriers to Effective use of language
Avoiding clichés
Removing redundancies
Getting rid of ambiguity
Euphemism
Jargons
Code switching

Examination Scheme:

<table>
<thead>
<tr>
<th>Components</th>
<th>CT1</th>
<th>CT2</th>
<th>CAF</th>
<th>V</th>
<th>GD</th>
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CAF – Communication Assessment File
GD – Group Discussion
GP – Group Presentation

Text & References:

Course Objective:
This course will help the students to:
- Explore interest and attitude
- Explore career opportunities
- Set career goals
- Developing attributes that employers value

Course Contents:

Module I: Exploring one’s interest and aptitude
Meaning: Interest and Aptitude
Knowing and assessing one’s Interest
Knowing and assessing one’s Aptitude

Module II: Explore Career
Selecting from available resources
Career selection (Jobs)
Career planning and development

Module III: Self Reliance Skills
- Self awareness, Self promotion, Self confidence
- Action planning, Networking, Negotiation
- Political awareness, Coping with uncertainty,
- Development focus, Transfer skills

Module IV: Employability skills
- Developing positive attributes at work place (personal and professional)
- Continued reflection of Self (Placements, events, Seminars, Conferences, Projects, Extracurricular Activities etc.)

Module V: Goal Setting for Career Development
- Goal setting and career planning
- Sustaining and maintaining career excellence
- Assessment of career graph (introduction, growth, maturity, stagnation and decline)

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
Course Objective:
Provide more exposure to day to day real life in France through dialogues, written documents and projects

Course Contents:

Module C: Unités 7, 8: PP. 89 - 116

Contenu lexical:

Unité 7:
1. Exprimer l’appartenance
2. Dire le droit, réclamer, donner les directions à l’oral et à l’écrit
3. Gérer l’argent
4. Décrire, définir un objet. Donner sa fonction
5. Parler de la vie professionnelle

Unité 8:
1. Exprimer les rapports de temps. Faire une chronologie
2. Rapporter des paroles
3. Indiquer les circonstances d’une action
4. Parler d’éducation, de recherche, d’histoire
5. Réfléchir à l’apprentissage du vocabulaire

Contenu grammatical:

1. Les pronoms possessifs
2. Les constructions relatives avec auquel, dont, préposition + lequel
3. Le subjonctif - possibilité, impossibilité, doute
4. Le participe présent et le gérondif
5. Le plus-que-parfait
6. Situation dans le temps (ce jour-là, la veille)
7. Le discours indirect au passé

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- le livre à suivre : Campus: Tome 2
Course Objective:
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany, and thereby enhance the capacity of the students to comprehend literary and business texts and hence increase their vocabulary of relative terminology.

Course Contents:

Module I
Comprehension of Business text

Module II
Comprehension of Literary text

Module III
Translation of Business text

Module IV
Translation of Literary text

Module V: Picture Description
Firstly recognize the persons or things in the picture and identify the situation depicted in the picture; Secondly answer questions of general meaning in context to the picture and also talk about the personal experiences which come to your mind upon seeing the picture.

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 – IX

Course Code: UMT 946  Credit Units: 02

Course Objective:
To enable students to deal with Spanish situations, writing formal/informal letters, using Past Tense, juxtaposing it with *preterito imperfecto*. Enabling them to comprehend and form complex sentences. Give students vocabulary of various situations.

Course Contents:

**Module I**
Name of food items, cuisines, vegetables, fruits.
Polite conversation, informal chats, in a restaurant… more useful vocabulary like at a stationery, books in a library, consumer items in shops.

**Module II**
Letter Writing (Formal/Informal) how to invite, how to accept or refuse invitation e concept of gerund.

**Module III**
At the post office
At a business appointment
At an official interview etc

**Module IV**
Conditional
Exercises related to the above

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Español En Directo I B, Español Sin Fronteras, Ven
- Material provided by the teacher from various sources
Course Objective:
To enable the students to converse in the language with the help of different sentence patterns and forms of verbs as polite form, request form etc.
Note: The teaching is done in Roman as well as Japanese script. Students will learn 40 to 50 kanjis by this semester.

Course Contents:

Module I: Polite and Humble forms
Polite and humble forms of addressing people.

Module II: Purpose
Explaining the purpose of doing some work.

Module III: Probability
The situation when one is not sure whether any action will take place or not.

Module IV: Different situations
Explaining the situations, as they seem to be.

Module V: Request
Requesting in formal and informal ways.

Learning Outcome
➢ Students can speak the language with the help of

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

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:
- Shin Nihon-go no Kiso Lesson No.-41 to 45.
- Vocabulary and topics taught are from the above-mentioned book.
Course Objective:
The Great Wall of China is NOT visible from outer space. It’s too thin. It’s just myth that it can be seen. The only man-made structures visible from space are: The Pyramids of Giza and the Hoover Dam. 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.

Module II
Enriching vocabulary by dealing with various daily scenarios and situations.
Pronunciation and intonation.

Module III
Character writing and stroke order

Module IV
About china Part I Lesson 3, 4
Short stories

Module V
Text based on –
Literature
History
Economy
Culture
Politics

Examination Scheme:

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C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- “Kan tu shuo hua” Part-II Lesson 14-19.
Course Code: UMT 001  Credit Units: 04

Course Objective:
This course introduces the students with the IPR, safety and ethical issues and their implications on the biotechnology industry.

Course Contents:

Module I

Module II

Module III

Module IV
Public acceptance issues for biotechnology: Case studies/experiences from developing and developed countries. Biotechnology and hunger: Challenges for the Indian Biotechnological research and industries. The Cartagena protocol on biosafety. Biosafety management: Key to the environmentally responsible use of biotechnology.

Module V
Ethical implications of biotechnological products and techniques. Social and ethical implications of biological weapons.

Examination Scheme:

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</table>

Text & References:

Text:
- The Law & Strategy of Biotechnology Patents, Sibley Kenneth,

References:
MICROARRAY TECHNOLOGY

Course Objectives:
This course will give an introduction to DNA microarray technology and present statistical methods for handling the complex data produced by experiments using the technology. The course seeks to provide instruction in the use of statistical tools used to analyze microarray data. The structure will correspond to the analytical protocol an investigator might follow when working with microarray data.

Course Contents:

Module I
Introduction to genomics, proteomics, DNA and protein microarray technology

Module II:
Production of DNA microarrays: Fabrication: spotted microarrays, oligonucleotide microarrays, Genotyping microarrays

Module III
Microarrays and bioinformatics: experimental design, standardization, statistical analysis, relation between probe and gene, public databases of microarray technology.

Module IV
Production of Protein Microarrays: Introduction, From DNA Arrays to Protein Arrays, Overview of Protein Microarray Spotting, Types of Protein Microarrays, Protein Arrays, Surface Chemistry, the Arraying Process, Detection Issues, Validation of Results, and Stability of Protein Microarrays.

Module V
Future Perspectives and Challenges. Case Studies.

Examination Scheme:

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Text & References:

Text:
- Microarrays for an Integrative Genomics (Computational Molecular Biology), Isaac S. Kohane, Alvin Kho, Atul J. Butte

References:
ECO-SOCIAL EVOLUTION AND BIOTECHNOLOGY

Course Code: UMT 003        Credit Units: 03

Course Objective:
Society has undergone an enormous change during the course of anthropogenic evolution. So has also the lifestyle of humans in an ecosystem. Such changes are reflected through the altered functioning of the human genome. The role of biotechnology in finding solution to such vexed problems needs special emphasis. Biotechnology has revolutionized the trends in defining some of the important applications in relation to changing global scenario of gene – environment interactions and the advances in human therapy.

Course Contents:

Module I: Eco system dynamics
Introduction to eco system dynamics and changes in response to socio ecological processes, concept of limiting factors and its implication in defining a system, effect of global warming in relation to population dynamics

Module II: Bioresource mining & conservation
Eco social dimensions in response to changing genetic profile of life system, microbial biosensors, biotechnology & conservation of biodiversity, genetic engineering & crop productivity

Module III
Structural – functional abnormalities of proteins and their effects on causation of diseases, structure based drug designing; biotechnology in healthcare.

Examination Scheme:

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</table>

Text & References:

Text:
- Principles of Internal Medicine; Harrisons 15th edition
- Text Book of physiology; Ganong.W, 9th edition
- Text Book of Biotechnology; Stryr
- Gene cloning; An Introduction by T.A. Brown, 4th edition

References:
- Environmental Science by Kevin Byrne (2001)
- Invasive Species in a changing world by Harold A. Mooney, Richard J. Hobbs (2000)
- Environmental Ecology : The Ecological Effects of Pollution, Disturbances and other Stresses by Bill Freedman (2005)
GUIDELINES FOR PROJECT FILE

Research experience is as close to a professional problem-solving activity as anything in the curriculum. It provides exposure to research methodology and an opportunity to work closely with a faculty guide. It usually requires the use of advanced concepts, a variety of experimental techniques, and state-of-the-art instrumentation. Research is genuine exploration of the unknown that leads to new knowledge which often warrants publication. But whether or not the results of a research project are publishable, the project should be communicated in the form of a research report written by the student.

Sufficient time should be allowed for satisfactory completion of reports, taking into account that initial drafts should be critiqued by the faculty guide and corrected by the student at each stage. The File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation.

In general, the File should be comprehensive and include

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

Report Layout

The report should contain the following components:

- **Title or Cover Page**
  The title page should contain the following information: Project Title; Student’s Name; Course; Year; Supervisor’s Name.

- **Acknowledgements** (optional)
  Acknowledgment to any advisory or financial assistance received in the course of work may be given.

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

- **Table of Contents**
  Titles and subtitles are to correspond exactly with those in the text.

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

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

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

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

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

- **Future prospects**

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

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

**Examples**

For research article


For book


**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