Master of Science – Applied Mathematics

Programme Structure

Curriculum & Scheme of Examination

2018

AMITY UNIVERSITY RAJASTHAN

JAIPUR

PROGRAM OBJECTIVE

The objective of Masters Programme in Mathematics of Amity University Haryana is to develop multifaceted academically excellent students in various areas of Mathematics. The course also aims to enhance the knowledge gained by them in the undergraduate curriculum so as to make them competent for future, academic or industrial pursuits.

The subjects included in the course curriculum suffice for both pure and applied aspects of Mathematics. Almost each applied subject is adequately supported by practical's to be conducted in well-equipped computer laboratories. Subjects like Operations Research, Probability & Statistics and Advanced Abstract Algebra & Linear Algebra have contents with conceptual approach so as to fulfill the requirements of current research and developmental needs. Industry oriented subjects like Fuzzy Sets & their Applications, Fluid Dynamics and Measure Theory have contents with industrial approach are taught for imparting knowledge of mathematical application in industry.

Therefore the present postgraduate curriculum in Mathematics aims to produce highly motivated challenging young mathematics personals to take our country on the path of Mathematical & Technical revolution.

Credits PG (2 years/ 4 semesters)			**PG**		
Semester	**Core (CC)**	**Domain Electives (DE)**	**VA**	**Open Electives(OE)**	**Total**
1	25	0	4	3	32
2	21	4	4	3	32
3	20	4	4	0	28
4	30	0	0	0	30
Total	**96**	**8**	**12**	**6**	**122**

Note:- CC - Core Course, VA - Value Added Course, OE - Open Elective, DE - Domain Elective

M. Sc (Applied Mathematics)

Programme Structure

FIRST SEMESTER

Code	Course	Category	L	T	P	Credits
MAM 101	Complex Analysis	CC	3	1	-	4
MAM 102	Real Analysis	CC	3	1	-	4
MAM 103	Advanced Differential Equation	CC	3	1	-	4
MAM104	Probability Theory & Statistics	CC	3	1	-	4
MAM 105	Computer Mathematics and C Language	CC	3	1	-	4
MAM 120	Computer Mathematics and C Language Lab.	CC	-	-	2	1
MAM 155	Seminar	CC	-	-	-	4
Open Elective 1						
		OE	3	-	-	3
Value Added Courses						
BCS 111	Communication Skills – I	VA	1	-	-	1
BSS 111	Behavioral Science – I	VA	1	-	-	1
	Foreign Language -I	VA	2	-	-	2
FLT 101	French- I					
FLG 101	German-I					
FLS 101	Spanish-1					
FLJ 101	Japanese-I					
FLC 101	Chinese-I					
	Total					32

SECOND SEMESTER

Code	Course	Category	L	T	P	Credits
MAM 201	Advanced Abstract Algebra & Linear Algebra	CC	3	1	-	4
MAM 202	Numerical Methods & Data Analysis	CC	3	1	-	4
MAM 203	Optimization Techniques	CC	3	1	-	4
MAM 204	Statistical Methods	CC	3	1	-	4
MAM 205	Computer Programming Using c++	CC	3	1	-	4
MAM 220	Statistical Method Lab	CC	-	-	2	1
DE Electives: Student has to select 1 course from the list of following DE electives						
MAM 206	Number Theory	DE	3	1	-	4
MAM 207	Topology					
MAM 208	Fuzzy Sets and their Applications					
MAM 209	Coding Theory					
MAM 210	Fluid Dynamics					
MAM 211	Special Functions and Transform Calculus					
Open Elective 2						
		OE	3	-	-	3
Value Added Courses						
BCS 211	Communication Skills – II	VA	1	-	-	1
BSS 211	Behavioral Science – II	VA	1	-	-	1
	Foreign Language – II	VA	2	-	-	2
FLT 201	French- II					
FLG 201	German-II					
FLS 201	Spanish-1I					
FLJ 201	Japanese-II					
FLC 201	Chinese-II					
	Total					32

SUMMER INTERNSHIP

Note: Students must submit their summer internship report immediately on return from summer vacation in July /August and the same would be evaluated for 4 credit units, which would be included in the Third Semester marks.

THIRD SEMESTER

Code	Course	Category	L	T	P	Credits
MAM 301	Mathematical Modeling	CC	3	1	-	4
MAM 302	Functional Analysis	CC	3	1	-	4
MAM 303	Discrete Mathematical Structures	CC	3	1	-	4
MAM 304	Mathematical Methods	CC	3	1	-	4
MAM 350	Summer Internship (Evaluation)	CC	-	-	-	4
DE Electives: Student has to select 1 course from the list of following DE electives						
MAM 305	Cryptography	DE	3	1	-	4
MAM 306	Biomechanics					
MAM 307	Classical Mechanics					
MAM 308	Partial Differential Equation					
MAM 309	Lebesgue Measure Theory					
MAM 310	Information Theory					
.	Value Added Courses	.	.	.	.	
BCS 311	Communication Skills - III	VA	1			1
BSS 311	Behavioral Science – III	VA	1			1
	Foreign Language – III	VA	2	-	-	2
FLT 301	French- III					
FLG 301	German-III					
FLS 301	Spanish-III					
FLJ 301	Japanese -III					
FLC 301	Chinese-III					
	Total					28

FOURTH SEMESTER

Code	Course	Category	L	T	P	Credits
MAM 460	Project	CC	-	-	-	30
	Total					30

FIRST SEMESTER

COMPLEX ANALYSIS

Course Code: MAM 101 **Credit Units: 04**

Course Objective:

The objective of this course module is to acquaint the students with the mathematics involved in basics of complex numbers, analytic function, complex integration, open mapping theorem and to get them familiar with various important applications in evaluating real integrals.

Course Contents:

Module I

Review of complex numbers; Analytic functions, harmonic functions, elementary functions, branches of multiple-valued functions.

Module II

Conformal mappings; Complex integration, Cauchy's integral theorem, Cauchy's integral formula.

Module III

Theorems of Morera and Liouville, maximum-modulus theorem; Power series, Taylor's theorem and analytic continuation.

Module IV

Zeros of analytic functions, open mapping theorem; Singularities, Laurent's theorem, Casorati-Weierstrass theorem, argument principle, Rouche's theorem, Cauchy's residue theorem and its applications in evaluating real integrals, Mittag-Leffler's theorem.

Module V

Bilinear transformation, Riemann mapping theorem, infinite products, Beta - Gamma function and its properties, functional equation for Beta and Gamma function, integral version of Beta & Gamma functions, Jensen formula, Poisson-Jensen formula.

Examination Scheme:

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

Text & References:

Text:

- R.V. Churchill and J.W. Brown, Complex Variables and Applications, 5th edition, McGraw Hill, 1990.
- J. H. Mathews and R. W. Howell, Complex Analysis for Mathematics and Engineering, 3rd edition, Narosa.
- Conway, .I.B., Functions of One complex variable Narosa Publishing, 2000.
- Ahlfors, L.V., Complex Analysis. McGraw-Hill Book Company, 1979.

References:

- L. V. Ahlfors, Complex Analysis, 3rd Edn., McGraw Hill, 1979.
- J. E. Marsden and M. J. Hoffman, Basic complex analysis, 3rd Edn., W. H. Freeman, 1999.
- Priestly, HA., Introduction to Complex Analysis Claredon Press, Orford, 1990.
- Liang-shin Hann & Bernard Epstein, Classical Complex Analysis, Jones and Bartlett Publishers International, London, 1996.
- D.Sarason, Complex Function Theory, Hindustan Book Agency, Delhi, 1994.
- Mark J.Ablewitz and A.S.Fokas, Complex Variables: Introduction & Applications, Cambridge University Press, South Asian Edition, 1998.
- E.C.Titchmarsn, The Theory *of* Functions, Oxford University Press, London.
- S.Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House, 1997.

REAL ANALYSIS

Course Code: MAM 102 Credit Units: 04

Course Objective:

The aim of the module is to introduce the students to the fundamental ideas of Real Analysis: limits of sequences, infinite series, limits of real functions, continuity, differentiability and the Riemann integral. The module should encourage students to think clearly and critically and to begin to be able to prove simple statements on their own.

Course Contents:

Module I

Sequences and series of functions, Pointwise and uniform convergence, Cauchy criterion for uniform convergence, Uniform convergence and continuity, Uniform convergence and differentiation, Weierstrass approximation theorem.

Module II

Set functions, intuitive idea of measure, Elementary properties of measure, Measurable sets and their fundamental properties. Lebesgue measure of sets of real numbers, Algebra of measurable sets; Borel sets, Equivalent formulation of measurable sets in terms of open, Closed, Fo and Gs sets, "Non measurable sets.

Module III

Measurable functions and their equivalent formulations, Properties of measurable functions. Approximation of measurable functions by sequences of simple functions, Measurable functions as nearly continuous functions, Egoroff s theorem, Lusin's theorem, Convergence in measure and F Riesz theorem for convergence in measure. Almost uniform convergence.

Module IV

Shortcomings of Riemann Integral, Lebesgue Integral of a bounded function over a set of finite measure and its properties. Lebesgue integral as a generalization of Reimann integral, Bounded - convergence theorem, Lebesgue theorem regarding points of discontinuities of Riemann integral. functions, Integral of non-negative functions, Fatou's Lemma, Monotone convergence-" Theorem, Geaeral Lebesgue Integral, Lebesgue convergence theorem.

Examination Scheme:

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

Text & References:

***Text*:**

- J. E. Marsden and M. J. Hoffman, Elementary Classical Analysis, 2nd Edn., W. H. Freeman, 1993.
- W. Rudin, Principles of Mathematical Analysis, 3rd Edn., McGraw Hill, 1976.

References:

- P. M. Fitzpatrick, Advanced Calculus, 2nd Edn., AMS, Indian Edition, 2010.
- N. L. Carothers, Real Analysis, Cambridge University Press, Indian Edition, 2009.

ADVANCED DIFFERENTIAL EQUATIONS

Course Code: MAM 103 Credit Units: 04

Course Objective:

In this course we will study differential equations as mathematical descriptions of situations which arise in science and engineering. We will learn how to find the exact solution of some equations, but we will see that this is not always possible or practical. In these cases we will learn to extract information about the behaviour of a solution from the differential equation itself. We will also study some simple techniques to find numerical approximations of solutions.

Course Contents:

Module I

Review of fundamentals of Differential equations (ODEs); Existence and uniqueness theorems. Power series solutions, Systems of Linear ODEs, Stability of linear systems.

Module II: Cell Organelles

Initial value problem and equivalent integral equation, e-approximate solution, equicontinuous set of functions. Ascoli- Arzela theorem, Cauchy -Peano existence theorem and its corollary. Lipschitz condition. Differential inequalities and uniqueness - Gronwall's inequality: Successive approximations. Picard-Lindelof theorem. Continuation of solution Maximal interval of existence , Extension theorem. Kenser's theorem(statement only).

Module III

Linear differential systems: Definitions and notations. Linear homogeneous systems; Fundamental matrix, Adjoint systems, reduction to smaller homogeneous systems. Non-homogeneous linear systems; variation of constants. Linear systems with constant coefficients. Linear systems with periodic coefficients. Floquet theory.

Module IV

Higher order equations: Linear differential equation (LDE) of order 'n', Linear combinations, Linear dependence and linear independence of solutions. Wronskian theory: Definition, necessary and sufficient condition for linear dependence and linear independence of solutions of homogeneous LDE. Abel's identity, Fundamental set, More Wronskian theory. Reduction of order. Non-homogeneous LDE. Variation of parameters. Adjoint equations, Lagrange's Identity, Green's formula. Linear equation of order n with constant coefficients.

Module V

System of differential equations, the n-th order equation, dependence of solutions on initial conditions and parameters. Maximal and Minimal solutions. Differential inequalities. A theorem of Wintner. Uniqueness theorems: Kamke's theorem, Nagumo's theorem and Osgood theorem.

Examination Scheme:

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

Text & References:

***Text*:**

- E.A. Coddington and N. Levinson, *Theory of Ordinary Differential Equations,* Tata McGraw-Hill, 2000.
- P. Hartman, *Ordinary Differential Equations,* John Wiley & Sons NY, 1971.

References:

- S.L. Ross, Differential Equations, John Wiley & Sons,
- G. Birkhoff and G.C. Rota, Ordinary Differential Equations, .John Wiley & Sons,1978.
- G.F. Simmons, Differential Equations,, Tata McGraw-Hill , 1993.
- I.G. Petrovski, Ordinary Differential Equations, Prentice-Hal!, 1966.
- D. Somasundaram, Ordinary Differential Equations, A first Course, Narosa Pub., 2001.
- S.G. Deo, V. Lakshmikantham and V. Raghavendra, Textbook of Ordinary Differential Equations, Tata McGraw-Hill, 2006.

PROBABILITY & STATISTICS

Course Code: MAM 104 Credit Units: 04

Course Objective:

This course aims to introduce the concept of probability as quantified uncertainty, to give a critique of the frequentist interpretation of probability and to provide the basic knowledge necessary to pursue further study in probability and statistics.

Course Contents:

Module I

Axiomatic definition of probability, probability spaces, probability measures on countable and uncountable spaces, conditional probability, and independence.

Module II

Random variables, distribution functions, probability mass and density functions, functions of random variables, standard univariate discrete and continuous distributions and their properties; Mathematical expectations, moments, moment generating functions, characteristic functions, inequalities.

Module III

Random vectors, joint, marginal and conditional distributions, conditional expectations, independence, covariance, correlation, standard multivariate distributions, functions of random vectors.

Module IV

Modes of convergence of sequences of random variables, weak and strong laws of large numbers, central limit theorems; Introduction to stochastic processes, definitions and examples.

Module V

Tests of significance, Hypothesis testing, Large samples, Small samples, Chi-square test.

Examination Scheme:

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

Text & References:

***Text*:**

- J. Jacod and P. Protter, Probability Essentials, Springer, 2004.
- V. K. Rohatgi and A. K. Md. E. Saleh, An Introduction to Probability and Statistics, 2nd Edn., Wiley, 2001.

References:

- P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2000.
- G. R. Grimmett and D. R. Stirzaker, Probability and Random Processes, 3rd Edn., Oxford University Press, 2001.
- S. Ross, A First Course in Probability, 6th Edn., Pearson, 2002.
- W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Edn., Wiley, 1968.
- J. Rosenthal, A First Look at Rigorous Probability Theory, 2nd Edn., World Scientific, 2006.

COMPUTER MATHEMATICS and 'C' LANGUAGE

Course Code: MAM 105 **Credit Units: 04**

Course Objective:

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

Course Contents:

Module I

Data Representation: Number systems, character representation codes, Binary ,octal, hexadecimal and their interconversions. Binary arithmetic, floating point arithmetic, signed and unsigned numbers, Memory storage unit.

Module II

Variables and Arithmetic Expressions. For statement Symbolic constants. Character Input Output Arrays. Functions. Arguments – Call by value. Character Arrays. External Variables and scope.

Module III

Variable Names. Data types and Sizes. Constants. Declarations. Arithmetic Operators. Relational and Logical Operators. Type Conversions. Increment and Decrement Operators. Biturses Operators. Assignment Operators and Expressions. Conditional Expressions. Precedence and Order of Evaluation.

Module IV

If – Else. Else – If. Switch. While and For, Co-while. Break and Continue, Go to and Lables.

Module V

Basics of Functions. Functions Returning Non-Integers. External Variables Scope Rules. Header Files. Static Variables. Register Variables. Block Structures. Initialization. Recursion.

Module VI

Pointers and Addresses. Pointers and function Arguments. Pointers and Arrays Address Arithmetic. Character Pointer and Functions. Pointer arrays; Pointers to Pointers. Multi-Dimensional Arrays Pointers vs Multi-Dimensional Arrays. Command line Arguments. Pointers to Functions.

Module VII

Basics of Structures. Structures and Functions. Arrays of Structures. Pointers to Structures. Unions.

Module VIII

Standard Input and Output Printf. Scan. File Access. Line Input and Output.

Module IX

Programming of Simple Mathematical Problems.

Examination Scheme:

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

Text & References:

Text:

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

References:

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

COMPUTER MATHEMATICS and 'C' LANGUAGE LAB

Course Code: MAM 125 **Credit Units: 01**

Software Required: Turbo C

Course Contents:

- C programs involving loops: Problems like finding the nth value of cosine series, Fibonacci series. Etc.
- C programs including user defined function calls.
- C programs involving arrays and matrices
- C programs involving pointers, and solving various problems with the help of those.
- File handling
- C programs involving strings
- C programs involving structures

Examination Scheme:

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

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

COMMUNICATION SKILLS – I

Course Code: BCS 111 Credit Units: 01

Course Objective:

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

Course Contents:

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

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

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

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

Module V: Activities
News reading
Picture reading
Movie magic
Announcements

Examination Scheme:

Components	CT1	CT2	CAF	V	GD	GP	A
Weightage (%)	20	20	25	10	10	10	5

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

Text & References:

- Working in English, Jones, Cambridge
- Business Communication, Raman – Prakash, Oxford
- Speaking Personally, Porter-Ladousse, Cambridge
- Speaking Effectively, Jermy Comfort, et.al, Cambridge

BEHAVIOURAL SCIENCE - I
(SELF-DEVELOPMENT AND INTERPERSONAL SKILLS)

Course Code: BSS 111 **Credit Units: 01**

Course Objective:

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

Course Contents:

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

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

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

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

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

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

Text & References:

- Towers, Marc: Self Esteem, 1st Edition 1997, American Media
- Pedler Mike, Burgoyne John, Boydell Tom, A Manager's Guide to Self-Development: Second edition, McGraw-Hill Book company.

- Covey, R. Stephen: Seven habits of Highly Effective People, 1992 Edition, Simon & Schuster Ltd.
- Khera Shiv: You Can Win, 1st Edition, 1999, Macmillan
- Gegax Tom, Winning in the Game of Life: 1st Edition, Harmony Books
- Chatterjee Debashish, Leading Consciously: 1998 1st Edition, Viva Books Pvt. Ltd.
- Dr. Dinkmeyer Don, Dr. Losoncy Lewis, The Skills of Encouragement: St. Lucie Press.
- Singh, Dalip, 2002, Emotional Intelligence at work; First Edition, Sage Publications.
- Goleman, Daniel: Emotional Intelligence, 1995 Edition, Bantam Books
- Goleman, Daniel: Working with E.I., 1998 Edition, Bantam Books.

FRENCH - I

Course Code: FLF 111 **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:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- le livre à suivre : Campus: Tome 1

GERMAN - I

Course Code: FLG 111 **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, wohnwn, 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:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

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: FLS 111 **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:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- Español, En Directo I A
- Español Sin Fronteras

JAPANESE - I

Course Code: FLJ 111 Credit Units: 02

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:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

Text:

- Teach yourself Japanese

References:

- Shin Nihongo no kiso 1

CHINESE – I

Course Code: FLC 111 Credit Units: 02

Course Objective:

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

Course Contents:

Module I

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

Module II

Greetings
Let me Introduce
The modal particle "ne".
Use of Please 'qing" – sit, have tea …….. etc.
A brief self introduction – Ni hao ma? Zaijian!
Use of "bu" negative.

Module III

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

Module IV

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

Module V

Family structure and Relations.
Use of "you" – "mei you".
Measure words
Days and Weekdays.
Numbers.
Maps, different languages and Countries.

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project + Presentation
I – Interaction/Conversation Practice

Text & References:

- "Elementary Chinese Reader Part I" Lesson 1-10

SEMINAR

Course Code: MAM 155 Credit Units: 03

Guidelines for Seminar

a) Choosing the topic
b) Finding relevant materials
c) Presentation
d) Response to queries
e) Submission of the write up

Presentation of the seminar will be of one hour maximum (30 min presentation and rest question answer session)

Examination Scheme:

Components	Weightage
Content	30
Presentation	40
Response to the queries	20
Write up	10

SECOND SEMESTER

ADVANCED ABSTRACT ALGEBRA

Course Code: MAM 201 **Credit Units: 04**

Course Objective:

The concepts and results of Algebra are fundamental to the study of Mathematics and represent a human achievement of great beauty and power. It is a core topic for all disciplines that use higher mathematics and logic. The purpose of this course is to develop theory and properties of some fundamental algebraic structures of groups, rings and modules, and fields.

Course Contents:

Module I

Normal groups, quotient groups, Class equation of groups, Groups of order < 10, Cauchy's Theorems for abelian and non – abelian groups, Sylow's Theorems for abelian and non – abelian groups, solvable groups, the symmetric group S_n for n > 4 is not solvable, Maximal subgroups, composition Series of a group, Jordan Holder Theorem.

Module II

Overview of Rings and Fields, Integral Domains, Euclidean domains, Unique Factorization domains, Modules, Definition and examples, Direct sum, Free modules, Quotient modules, Simple modules, Modules over Principle ideal domains, Modules with chain conditions, Artenian Modules, Noetherian Modules, Hilbert's basis theorem

Module III

Overview of vector spaces, Extension of Fields, Finite Extension of a field, Algebraic and transcendental extensions of a field, roots of a polynomial, Existence of a root of an irreducible polynomial in some extension, splitting fields, Separable and inseparable extensions, Normal extension of a field.

Module IV

Linear operators and matrices Similarity of linear transformations. Invariant subspaces. Reduction to triangular forms. Nilpotent transformation.Index of nilpotency. Invariants of a nilpotent transformation. The primary decomposition theorem.

Examination Scheme:

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

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

Text & References:

- N. Herstein, Topics in Algebra, John Wiley & Sons, Singapore
- C. Musili, Introduction to Rings and Modules, Narosa Publishing House, New Delhi
- P. B. Bhattacharya, S.K. Nagpaul, Basic Abstract Algebra (2nd Ed.) , Cambridge University Press, Indian Edition, 1997.
- M. Artin, Algebra, Prentice Hall of India, New Delhi.
- N. Jacobson, Basic Algebra(Vols. I & II), W.H. Freeman. 1980
- S. Lang, ALGEBRA 3rd Edition, Pearson Education Asia, New Delhi
- S. Luther and IBS Passi, Algebra (Vols I & II), Narosa Publishing House, New Delhi
- S. Singh and Q. Zameeruddin, Modern Algebra, New Age Publishers, New Delhi.

NUMERICAL METHODS AND DATA ANALYSIS

Course Code: **MAM 202** **Credit Units: 04**

Course Objective:

The objective of the present course is to introduce some advanced measurement, numerical methods and data analysis commonly used in research to the post graduate students.

Course Contents:

Module I: Solution of Algebraic and Transcendental Equations

Bisection method, Muller's method, Newton - Raphson method, Solution of simultaneous linear equations: Gauss' Elimination Method, Jacobi iterative method, Gauss-Seidel method.

Module II: Finite Difference, Interpolation and Curve Fitting

Finite differences, Newton's formula for interpolation, Gauss, Stirling, Bessel's, Everett's formulae, Divided differences, Newton's general interpolation formula, Lagrange's interpolation formula, Method of Least square curve fitting, straight line and quadratic equation fitting, curve fitting by sum of exponentials.

Module III: Numerical Differentiation, Integration and Ordinary Differential Equations

Numerical differentiation, Numerical integration, Trapezoidal rule, Simpson 1/3 and 3/8 rules, Gauss quadrature formula. Numerical solution of ordinary differential equations using Euler, Picard and Runge-Kutta methods of 2^{nd} and 4^{th} order.

Module IV: Data Analysis

Data interpretation and analysis: Precision and accuracy, error analysis, propagation of errors, Gaussian distribution, determination of mean value and standard deviation of the continuous Gaussian distribution, graphical representation of functional relationship, linear and nonlinear least square curve fitting, chi-square test for goodness of fit.

Examination Scheme:

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

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

Text & References:

- S.S. Shastri, Introductory Methods of Numerical analysis, Pearson education
- C.E. Froberg, Introduction to Numerical Analysis, Addison –Wesley 1981.
- E. Scheid, Numerical Analysis, Mc Graw Hill 1988.
- M.K. Jain, S.R.K. Iyengar and R. K. Jain, Numerical methods for scientific & Engineering. Computations, New Age International Publishers, New Delhi.
- K Atkinson, Elementary Numerical Analysis, Wiley 1985.

OPTIMIZATION TECHNIQUES

Course Code: MAM 203 Credit Units: 04

Course Objective:

The problems in optimization are the most common applications of mathematics. The main aim of this course is to present different methods of solving optimization problems in the areas of linear programming, non linear programming, and integer linear programming. In addition to theoretical treatments, there will be some introduction to numerical methods for optimization problems.___

Course Contents:

Module I: Linear Programming Problems (LPP)

Definition of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Charnes' Big M method. Sensitivity Analysis, Revised Simplex Method, Duality, Dual Simplex Method

Module II: Transportation Problems

Introduction to Transportation Model, Matrix Form of TP, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution.
Assignment Problems: Definition, Hungarian Method for AP.

Module III: Integer Linear Programming Problems

Integer Linear Programming Problems, Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method

Module IV: Dynamic Programming
Bellman's Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem.

Examination Scheme:

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

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

Text & References:

- Hadley, G.,"Linear Programming,", Addison-Wesley, Mass.
- H.A.Taha,"Operations Research – An Introduction", Macmillian
- F.S. Hiller, , G.J. Lieberman, " Introduction to Operations Research", Holden-Day
- 4. Harvey M. Wagner, "Principles of Operations Rsearch with Applications to Managerial Decisions", Prentice Hall of India Pvt. Ltd.
- K. Swarup, P. K. Gupta and Man Mohan, "Operation Research", Sultan Chand & Sons, New Delhi

STATISTICAL METHODS

Course Code: MAM 204 **Credit Units: 04**

Course Objective:

The aim of this course is to provide basic ideas of probability and probability distribution theory, statistical Inference and to the student understand the principles and methods of statistics regression, and to analyze numerical data and draw inferences.

Course Contents:

Module I: Probability & Probability Distributions

Classical and Modern axiomatic definition of probability, Addition and Multiplication rule of probability, Testing the independence of events, Random variables and probability Distribution, Conditional probability, Baye's Theorem, Discrete and Continuous Distribution, Moment Generating Functions, Binomial distribution, Poisson distribution, Negative Binomial distribution, Exponential distribution and Normal Distribution.

Module II: Statistical Methodology

Theory of sampling, different methods of sampling: Random sampling, stratified sampling, cluster sampling, systematic sampling etc. Distribution of sample mean and variance, Test of significance: normal, t, Chi-square, F-test and Analysis of variance – one way classification

Module III: Elementary Statistical Inference

Theory of estimation: Characteristics of estimators, concept of consistency, unbiased ness, and efficiency, Method of estimation, Cramer Rao Inequality

Module IV: Correlation and Regression

Bivariate normal distribution, types, importance, methods of measuring correlation-scatter diagram, Karl Pearson's and Spearman's rank Correlation. Regression lines, Difference between regression and correlation, uses of Regression, Standard Error of estimate. Introduction of Partial and Multiple correlations.

Examination Scheme:

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

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

Text & References:

- Biswas and Srivastava- A Textbook, Mathematical Statistics, Ist Edition, Narosa Publishing House, New Delhi.
- Feller,W.(1971): Introduction to Probability Theory and its Applications, Vol. I and II. Wiley Eastern-Ltd
- V. K.Rohatgi, (1984): An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern.
- Hogg, R.V. and Craig, A.T.(1971): Introduction to Mathematical Statistics, McMillan.
- Mood, A.M., Graybill,F.A. and Boes, D.C.(1974): Introduction to the Theory of Statistics, McGraw Hill.
- Des Raj & Chandak (1998): Sampling Theory, Narosa Publishing House.
- Mathematical Statistics by Gupta and Kapoor, Sultan Chand and Sons

COMPUTER PROGRAMMING USING C++

Course Code: MAM 205 **Credit Units: 04**

Course Objective:

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

Course Contents:

Module I: Introduction

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

Module II: Classes and Objects

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

Module III: Inheritance

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

Module IV: Polymorphism

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

Module V: Strings, Files and Exception Handling

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

Examination Scheme:

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

Text & References:

Text:

- A.R. Venugopal, Rajkumar, T. Ravishanker “Mastering C++”, TMH, 1997
- R. Lafore, “Object Oriented Programming using C++”, BPB Publications, 2004.
- “Object Oriented Programming with C++” By E. Balaguruswamy.

References:

- Parasons, “Object Oriented Programming with C++”, BPB Publication, 1999.
- Yashwant Kanetkar, “Object Oriented Programming using C++”, BPB, 2004

STATISTICS LAB

Course Code: **MAM 220** **Credit Units: 02**

Course Objective:

The objective of this Lab work is to acquaint students to use statistical software in computation and interpretation of various statistical results

Contents

Fundamentals of R, and SPSS software and their application in computation of:

1. Measurement of Central Tendencies
2. Measurement of Dispersion
3. Measurement of Skewness & Kurtosis
4. Analysis of Correlation & Regression
5. Sampling from discrete and continuous Probability Distribution (Binomial, Poisson, Geometric, Negative Binomial, Exponential, Gamma, Normal)
6. Test of Significance (Chi-square Test, F-test, Analysis of Variance)
7. Construction of a Matrix
8. Rank of a Matrix
9. Inverse of a Matrix
10. Solution of Linear Equations
11. Estimation of Eigen Values and Eigen Vectors
12. Testing and Evaluation of nature of Quadratic forms (+ve definite, -ve definite, Indefinite)

Examination Scheme:

Components	TA	Viva	LR	ATTD	EE
Weightage(%)	7	10	8	5	70

TA: Teacher's Assessment, Viva - Viva Voce Exam., LR: Lab Record ATTD: Attendance EE: End Semester Examination

Text & References:

- Biswas and Srivastava- A Textbook, Mathematical Statistics, Ist Edition, Narosa Publishing House, New Delhi.
- Feller,W.(1971): Introduction to Probability Theory and its Applications, Vol. I and II. Wiley Eastern-Ltd
- Hogg, R.V. and Craig, A.T.(1971): Introduction to Mathematical Statistics, McMillan.
- Mood, A.M., Graybill,F.A. and Boes, D.C.(1974): Introduction to the Theory of Statistics, McGraw Hill.
- Des Raj & Chandak (1998): Sampling Theory, Narosa Publishing House.

DOMAIN ELECTIVES

NUMBER THEORY

Course Code: **MAM 206** **Credit Units: 04**

Course Objective:

Number theory is an important area of study in Mathematics. Without the knowledge of the beviour of various numbers and their properties, the study of Mathematics is in a way is meaningless. The purpose of this course is to teach students various concepts that have been used to study and apply in coding theory, cryptology besides in algebra and analysis.

Course Contents:

Module I

Euclid's division lemma, Divisibility, The Linear Diophantine Equation, The fundamental theorem of Arithmetic, Fermat's Little theorem, Wilson's Theorem, Generating functions, Basic Properties of Congruences, Residue Systems, Linear Congruence, The Theorems of Fermat and Wilson Revisited, The Chinese Remainder Theorem, Polynomial Congruences.

Module II

Combinatorial Study of $\varphi(n)$, Formulae for d(n) and $\sigma(n)$, Multiplicative Arithmetic Functions, The Mobius Inversion Formula, Properties of Reduced Residue Systems, Primitive Roots Modulo p, Elementary properties of $\Pi(x)$, Tchebychev's Theorem.

Module III

Euler's Criterion, the Legendre Symbol, The Quadratic Reciprocity Law, Applications of the Quadratic Reciprocity Law, Consecutive Residues and Non-residues, consecutive Triples of Quadratic Residues.

Module IV

Sum of Two Squares, Sum of Four Squares, Euler's Partition Theorem, Dirichlet's Divisor Problem.

Examination Scheme:

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

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

Text & References:

Text:

- George E. Andrews: Number Publishing Corporation Theory, Hindustan (India).
- Niven, I., Zuckerman, S.H., Montgomery, L.H., An Introduction to the Theory of Numbers, John Wiley and Sons. New York

References:

- Flath J., Introduction to Number Theory.
- Ireland & Rosen, *A Classical Introduction to Modern Number Theory*, Springer Verlage.
- Cassels, J.W.S., Frolich, A., *Algebraic Number Theory*, Cambridge University Press, London

TOPOLOGY

Course Code: **MAM 207** **Credit Units: 04**

Course Objective:

Topology is a modern branch of geometry. It serves to lay the strong foundations of concepts for study in analysis and in geometry. It is also a prerequisite for many concepts related to Analysis.

The course is designed to develop an understanding of topological ideas & techniques and their role in analysis.

Course Contents:

Module I: Definition and examples of topological space

Base and sub base for a topology, Subspaces and relative topology, Closed sets, Neighbourhoods, interior, exterior, boundary, contact and limit points of sets, derived sets, dense sets and nowhere dense subsets. Alternate methods of defining a topology in terms of Kuratowski Closure Operator and Neighborhood Systems,

Homeomorphism: Definition and properties of continuous function, open functions, closed functions, Homeomorphisms uniform continuous functions.

Product spaces: Box topology, weak topology, Tychonoff topology.

Module II: Count ability and Separation Axioms

First and Second Countable spaces, Lindeloff spaces, Separable spaces. Their relationship among themselves and other basis properties, To, T1, T2, regular and T_3, completely regular and T3½, normal and T_4 separation axioms, their Characterizations and basic properties. Urysohn's lemma, Tietze extension theorem.

Module III: Compactness

Continuous functions and compact sets. Basic properties of compactness. Compactness and finite intersection property, Sequentially and countable compact sets. Compactness in metric spaces. Equivalence of compactness, countable compactness and sequential compactness in metric spaces. Tychonoff's Product Theorem. Local compactness, Compactification, one point and Stone - Cech compactification.

Module IV: Connected Spaces

Separated sets, Connected and disconnected sets, continuity and connectedness, components, totally disconnected spaces, Connectedness and the real line, locally connected spaces.

Examination Scheme:

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

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

Text & References:

Text:

- R. Munkres, Topology, A First Course, Pearson. N. Delhi, 2000.
- W. J. Pervin, Foundation of General Topology, Academic Press Inc., New York, 1964

Reference:

- N. Bourbaki, Topology I and II, Springer Verlag, New Delhi
- S. Willard, General Topology, Addison-Wesley, Reading, 1970. Reprinted by Dover
- J. Dugundji, Topology, Allyn and Bacon, 1966 (Reprinted in India by PHI).
- J. L. Kelley, General Topology, D Van Nostrand Reinhold Co. New York 1955 (Reprinted by Springer Verlag, New York.
- K D Joshi, Introduction to General Topology, New Age International (p) Ltd, 1983
- L. A. Steen and J A Seebach, Counter Examples in Topology, Holt, Reinhart and Winston, Inc. New York, 1970.

FUZZY SETS AND THEIR APPLICATIONS

Course Code: **MAM 208** **Credit Units: 04**

Course Objective:

The aim of this course is to familiarize students with fundamental knowledge of fuzzy sets, fuzzy logic and its applications in fuzzy decision making. Upon successful completion of this course, students shall be able to understand basic knowledge of fuzzy sets and fuzzy logic, be able to apply fuzzy inferences, be able to apply fuzzy information in decision making, and be able to appreciate the theory of possibility on the basis of evidences.

Course Contents:

Module I: Introduction to Fuzzy Sets

Basic definitions, α -level sets, comparison with classical (crisp) sets, types of fuzzy sets, extension principle, Operations on Fuzzy Sets: Fuzzy complement, t-norms, t-co norms, combination of operations, aggregation operations.

Module II: Fuzzy Numbers and Their Arithmetic

Fuzzy numbers, linguistic variables, arithmetic operations on intervals, arithmetic operations on fuzzy numbers, lattice of fuzzy numbers, fuzzy equations.

Module III: Fuzzy Relations and Possibility Theory

Crisp versus fuzzy relation, projections and cylindrical extensions, binary fuzzy relations, binary relations on single set, fuzzy equivalence relations, fuzzy compatibility and fuzzy ordering relations. Fuzzy measures, evidence theory, possibility theory, fuzzy sets and possibility theory.

Module IV: Fuzzy Logic and Uncertainty-based Information

An overview of classical logic, multivalued logic, fuzzy propositions, fuzzy quantifiers, linguistic hedges, inference from conditional fuzzy propositions, inference from conditional and qualified propositions, Information and uncertainty, non-specificity of crisp and fuzzy sets, fuzziness of fuzzy sets.

Examination Scheme:

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

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

Text & References:

- George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall of India, New Delhi.
- H.J. Zimmermann, Fuzzy Set Theory & its Applications, Allied Publishers Ltd. New Delhi.
- Timothy J. Ross, Timothy J. Ross, Fuzzy Logic with Engineering Applications, McGraw Hills inc. New Delhi.

CODING THEORY

Course Code: **MAM 209** **Credit Units: 04**

Course Objective:

The objectives of the course are to teach the students how to produce algebraic codes based on the methods of groups and finite fields and to make the students familiar with some of the most widely used codes and their applications. After learning this course, **s**tudents will be able to understand and implement the most widely used algebraic codes, write programs coding and decoding messages.

Course Contents:

Module I

The Communication Channel, the coding problem, types of codes, Error – Detecting and Error – Correcting Codes, linear Codes. The Hemming metric, description of Linear Block Codes by matrices.

Module II

Dual Codes, Standard Array Syndrome, Step by Step Decoding Modular Representation, Error – Correction Capabilities of linear codes, Bounds of Minimum Distance for Block Codes, Plotkin Bound, Hamming sphere packing bound bounds for Burst – Error Detecting and Correcting Codes.

Module III

Important linear Block – Codes, Hamming Codes, Golay Codes, Perfect Codes, Quasi – perfect Codes, Reed – Muller Codes, Codes derived by Hadamard Matrices, Product Codes. Concatenated codes.

Module IV

A double-error correcting decimal Code and an introduction to BCH Codes, BCH bounds, Cyclic Codes, Matrix representation of Cyclic Codes, Hamming and Golay Codes as Cyclic Codes, Error detection with Cyclic codes, MDS Codes.

Examination Scheme:

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

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

Text & References:

- J H Van Lint, Introduction To Coding Theory, Springer Verlag, Heidelberg
- V. Pless, Introduction to the theory of Error – Correcting Codes (3rd Ed.), 1998, Wiley Interscience, New York
- V. Pless and W C Huffman, Fundamentals of Error – Correcting Codes, 2003, Cambridge University Press.
- R. Hill, A first course in Coding Theory, Oxford University Press, 1986.
- M. Y. Rhee, Error Correcting Coding Theory, McGraw Hill Inc., 1989

FLUID DYNAMICS

Course Code: **MAM 210** **Credit Units: 04**

Course Objective:

Almost everything on this planet is either in a state of fluid or moves within or near a fluid. Fluids have the ability to transport matter and its properties as well as transmit force. The main objective of the course is to develop fundamental knowledge and understanding of the mechanics of fluid both at rest and in motion.

Course Contents:

Module I: Concept of fluid and its physical properties

Continuum hypothesis, Kinematics of Fluids, methods of describing fluid motion, translation, rotation and deformation of fluid elements, Stream Lines, Path lines and Streak lines, Vorticity.

Module II: General theory of stress

Rate of strain in a real fluid, Symmetry of stress tensor, Principal axes and Principle values of stress tensor, Constitutive equation for Newtonian Fluid. Conservation of mass, Conservation of momentum, Conservation of energy. One and two dimensional in viscid incompressible flow.

Module III: Equation of continuity

Motion using stream tube, Circulation, Velocity potential, Irrotational flow, Some theorems about rotational and irrotational flows, Stoke's theorem, Kelvin's minimum energy theorem, Gauss theorem, Kelvin's circulation theorem, Vortex motion and its elementary properties, Integration of equations of motion, Bernoulli's equation, Stream function in two dimensional motion, Complex variable technique, Blasius theorem, Milne's circle theorem, Sources, Sinks and Doublets.

Module IV: Incompressible viscous fluid flows

Steady flow between two parallel plates (nonporous and porous), Plane Couette flow, Plane Poiseuille flow, Generalized plane coquette flow, Steady flow of two immiscible fluids between two rigid parallel plates, Steady flow through tube of uniform circular cross section, Steady flow through annulus under constant pressure gradient, Unsteady flow over a flat plate, Unsteady flow between two rigid parallel plates. Dynamical similarity, Buckingham's pie theorem, Non-dimensional numbers and their physical significance.

Examination Scheme:

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

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

Text & References:

Text:

- S. W. Yuan, Foundations of Fluid Mechanics, Chapters- 1, 3, 4, 5, 6, 7, 8.
- R. K. Rathy, An Introduction of Fluid Dynamics, Chapters – 1, 3, 4, 5, 6, 7,8,11. Oxford and IBH Publishing company, New Delhi, 1976.

References:

- G. K. Betchelor, An Introduction of Fluid Mechanics, Oxford University Books, New Delhi, 1994.
- F. Charlton, Text Book of Fluid Dynamics, C.B.S. Publishers, Delhi. 1985

Special Functions and Transform Calculus

Course Code: **MAM 211** **Credit Units: 04**

Course Objective:

The aim of this course is to provide basic ideas of Laplace transform and how to compute it for standard examples, Applications of Fourier and Laplace transforms to partial differential equations and the significance of absolute integrability.

Course Contents:

Module I: Gauss's Hypergeometric Functions : Definition,integral representation,deductions from integral representation,Gauss's hypergeometric differential equation and its solutions,relations between the solutions of hypergeometric equation,relations of contiguity, two summation theorems,Kummer's confluent hypergeometric function.

Module II: Bessel's Functions and Legendre's Function : Bessel's functions of first and second kind,simple recurrence relations, orthogonal property of Bessel's,Transformation, Generating functions, Legendre's function of first kind. Simple recurrence relations, Orthogonal property, Generating functions.

Module III: Hermite Polynomials: Hermite differential equation and its solution,generating function,hypergeometric form,recurrence formulas,rodrigue's formula,orthogonal property.

Module IV: Fourier Transform: Complex form of Fourier Transform and its inverse, Fourier sine and cosine transform and their inversion. Applications of Fourier Transform to solution of partial differential equations having constant co-efficient with special reference to heat equation and wave equation.

Module V: Hankel Transform: Definition and elementary properties,inversion theorem,Hankel transform of derivatives, Parseval theorem.

Examination Scheme:

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

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

Text and References:

Text:

- Special Functions, E.D. Rainville, Chelsea Publishing Comp.,
- Bronx , New York.
- The use of integral transforms,I.N. Sneddon,Mcgraw Hill
- Integral Transform, Sharma and Vasishtha

Reference:

- Advanced Differential Equations,M.D. Raisinghania, S.Chand & Comp.,New Delhi.
- Special Functions and Their Applications, N. N. Lebedev [PH]

COMMUNICATION SKILLS - II

Course Code: **BCS 211** **Credit Units: 01**

Course Objective:

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

Course Contents:

Module I: Job Correspondence

Job Applications

Resume & CV

Follow Up Letter

Module II: Dynamics of Group Discussion

Methodology

Guidelines

Module III: Speaking for Employment

Types of Interview (Technical & HR Rounds)

Fundamentals of Facing Interviews

Question Answer on Various Dimensions

Examination Scheme:

Components	CT	A	Group Presentation	Group Discussion	End Term Written Exam
Weightage (%)	10	05	15	10	60

Text & References:

- Jones, Working in English, 1st ed. Cambridge, CUP 2001
- Raman Prakash Business Communication, 2nd ed. Delhi OUP 2006
- Comfort , Jermy Speaking Effectively, Jermy, et.al, Cambridge, CUP, 1994
- Soft skills for Everyone, Jeff Butterfield, Cengage Learning. 2011

BEHAVIOURAL SCIENCE – II

(BEHAVIOURAL COMMUNICATION AND RELATIONSHIP MANAGEMENT)

Course Code: **BSS 211** **Credit Units: 01**

Course Objective:

This course aims at imparting an understanding of:
Process of Behavioural communication
Aspects of interpersonal communication and relationship
Management of individual differences as important dimension of IPR

Course Contents:

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

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

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

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

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

Viva based on personal journal
Assessment of Behavioural change as a result of training
Exit Level Rating by Self and Observer
Examination Scheme:

Components	SAP	IWT (CT)	JFS	A	End Term

					Written Exam
Weightage (%)	10	10	15	05	60

SAP: Social Awareness Progammes; IWT: Internal Written Test; JFS: Journal Success; A: Attendance

Text & References:

- Vangelist L. Anita, Mark N. Knapp, Inter Personal Communication and Human Relationships: Third Edition, Allyn and Bacon
- Julia T. Wood. Interpersonal Communication everyday encounter
- Simons, Christine, Naylor, Belinda: Effective Communication for Managers, 1997 1st Edition Cassell
- Harvard Business School, Effective Communication: United States of America
- Beebe, Beebe and Redmond; Interpersonal Communication, 1996; Allyn and Bacon Publishers.

FRENCH - II

Course Code: **FLF 211** **Credit Units: 02**

Course Objective:

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

Course Contents:

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

Module B: pp. 47 to 75 Unité 4, 5

Contenu lexical: **Unité 3: Organiser son temps**

1. donner/demander des informations sur un emploi du temps, un horaire SNCF – Imaginer un dialogue
2. rédiger un message/ une lettre pour …
   i) prendre un rendez-vous/ accepter et confirmer/ annuler

   ii) inviter/accepter/refuser
3. Faire un programme d'activités
   imaginer une conversation téléphonique/un dialogue

   Propositions- interroger, répondre

Unité 4: Découvrir son environnement

1. situer un lieu
2. s'orienter, s'informer sur un itinéraire.
3. Chercher, décrire un logement
4. connaître les rythmes de la vie

Unité 5: s'informer

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

Contenu grammatical:

1. Adjectifs démonstratifs
2. Adjectifs possessifs/exprimer la possession à l'aide de:

   i. « de » ii. A+nom/pronom disjoint

3. Conjugaison pronominale – négative, interrogative - construction à l'infinitif
4. Impératif/exprimer l'obligation/l'interdiction à l'aide de « il faut…. »/ «il ne faut pas… »
5. passé composé
6. Questions directes/indirectes

Examination Scheme:

Components	**CT**	**A**	**Assignment**	**Class Performance/ Presentation/ Viva**	**End Term Written Exam**
Weightage (%)	10	05	10	15	60

Text & References:

- le livre à suivre: Campus: Tome 1

GERMAN – II

Course Code: **FLG 211** **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 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, lessen, schlafen, sprechen und ähnliche).

Module III: Separable verbs

To comprehend the change in meaning that the verbs undergo when used as such

Treatment of such verbs with separable prefixes

Module IV: Reading and comprehension

Reading and deciphering railway schedules/school time table

Usage of separable verbs in the above context

Module V: Accusative case

Accusative case with the relevant articles

Introduction to 2 different kinds of sentences – Nominative and Accusative

Module VI: Accusative personal pronouns

Nominative and accusative in comparison

Emphasizing on the universal applicability of the pronouns to both persons and objects

Module VII: Accusative prepositions

Accusative propositions with their use

Both theoretical and figurative use

Module VIII: Dialogues

Dialogue reading: 'In the market place'

'At the Hotel'

Examination Scheme:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam
Weightage (%)	10	05	10	15	60

Text & References:

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

SPANISH – II

Course Code: **FLS 211** **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

Examination Scheme:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam

Weightage (%)	10	05	10	15	60

Text & References:

- Español, En Directo I A
- Español Sin Fronteras

JAPANESE - II

Course Code: **FL J 211** **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:

Components	CT	A	Assignment	Class Performance/ Presentation/	End Term Written Exam

				Viva	
Weightage (%)	10	05	10	15	60

Text & References:

Text:

- Teach yourself Japanese

References:

- Shin Nihongo no kiso 1

CHINESE – II

Course Code: **FLC 211** **Credit Units: 02**

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 muchit costs?

Dialogue on change of Money.

More sentence patterns on Days and Weekdays.

How to tell time. Saying the units of time in Chinese. Learning to say useful phrases like – 8:00, 11:25, 10:30 P.M. everyday, afternoon, evening, night, morning 3:58, one hour, to begin, to end ….. etc.

Morning, Afternoon, Evening, Night.

Module III

Use of words of location like-li, wais hang, xia

Furniture – table, chair, bed, bookshelf,.. etc.

Description of room, house or hostel room.. eg what is placed where and how many things are there in it?

Review Lessons – Preview Lessons.

Expression ‘yao”, “xiang” and “yaoshi” (if).

Days of week, months in a year etc.

I am learning Chinese. Is Chinese difficult?

Module IV

Counting from 1-1000

Use of “chang-chang”.

Making an Inquiry – What time is it now? Where is the Post Office?

Days of the week. Months in a year.

Use of Preposition – “zai”, “gen”.

Use of interrogative pronoun – “duoshao” and “ji”.

“Whose”??? Sweater etc is it?

Different Games and going out for exercise in the morning.

Module V

The verb “qu”

Going to the library issuing a book from the library

Going to the cinema hall, buying tickets

Going to the post office, buying stamps

Going to the market to buy things.. etc

Going to the buy clothes …. Etc.

Hobby. I also like swimming.

Comprehension and answer questions based on it.

Examination Scheme:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam
Weightage (%)	10	05	10	15	60

Text & References:

- "Elementary Chinese Reader Part I" Lesson 11-20

THIRD SEMESTER

MATHEMATICAL MODELING

Course Code: **MAM 301** **Credit Units: 04**

Course Objective:

Mathematical modeling is a process of creating a mathematical representation of some phenomenon in order to gain a better understanding of that phenomenon. The main goal of this course is to learn how to make a creative use of some mathematical tools such as difference equations, ordinary and partial differential equations, Numerical analysis to build a mathematical description of some physical problems.

Course Contents:

Module I

Introduction to modeling, Examples and definitions, classification of mathematical Modeling, Dimensional Analysis, Traffic flow modeling, techniques of mathematical modeling, Characteristics of mathematical modeling, steps in mathematical modeling, limitations of mathematical modeling.

Module II

Modeling and Simulation, Methods of developing a simulation model, designing a simulation experiment, How to perform simulation analysis, Advantages of simulation modeling, some pitfalls to guard against simulation

Module III

Modeling with difference equations, overview of basic concepts concerning matrices, eigenvalues and eigenvectors, The Harrod Model, the cobweb model, Samuelson's interaction model, application to Actuarial Science, Application to population dynamics and genetics.

Module IV

Queuing models, Poisson Process, Pure birth death process – M/M/1, M/M/c, M/Ek/1 queuing models, steady state probabilities, waiting time distribution. Cost consideration in network models.

Module V

Mathematical modeling through calculus of variations and dynamic programming, optimization principles and techniques, Problems related to maximum entropy distribution, geometrical problems, bio-economical problems, maximization and minimization problems, cargo loading problem, transportation problems, inventory problems.

Examination Scheme:

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

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

Text & References:

Text:

- J N Kapur, Mathematical Modeling, New Age International (P) Ltd., Publishers, New Delhi

References:

- 1.Hamdy A Taha, Operations Research, Pearson Educational Asia Edition
- F R Giordano, M D Weir, and W P Fox, A First Course in Mathematical Modeling
- A. Maria, Introduction to Modeling and simulation, Proceedings, Winter Simulation Conference, 1997
- M M Gibbons, A Concrete Approach to Mathematical Modeling, John Wiley and Sons.
- P.E. Wellstead, Introduction to Physical System Modeling, Academic Press, 1977.

FUNCTIONAL ANALYSIS

Course Code: **MAM 302** **Credit Units: 04**

Course Objective:

The course aims at familiarizing students with the basic concepts, principles and methods of analysis and its applications. Functional analysis develops the tools from calculus and linear algebra further to the more general setting where one has vector spaces comprising functions or general abstract infinite-dimensional vector spaces.

Course Contents:

Module I

Normed linear spaces, Banach spaces, Quotient spaces, continuous linear transformations, equivalent norms, the Hahn-Banach theorem and its consequences. Conjugate space and separability, second conjugate space.

Module II

The open mapping Theorem, The closed graph theorem, The conjugate of an operator, The uniform boundedness principle, Definition and examples and simple properties of Hilbert spaces.

Module III

Orthogonal complements, The projection theorem, orthogonal sets, The Bessels inequality, Fourier expansion and Parseval's equation, separable Hilbert spaces, The conjugate space, Riesz's theorem, The adjoint of an operator

Module IV

Self adjoint operators, Normal and unitary operators, Projections, Eigen values and eigen vectors of on operator on a Hilbert space, The determinants and spectrum of an operator, The spectral theorem on a finite dimensional Hilbert space.

Examination Scheme:

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

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

Text & References:

- G.F. Simmons : Topology and Modern Analysis, McGraw Hill (1963).
- A.H. Siddiqui: Functional Analysis with Application. Tata Mcgraw –Hill publishing Company Ltd, New Delhi.
- B.K. Lahiri, Elements of functional Analysis, The World Press Pvt. Ltd., Calcutta1994.
- J.B. Conway, A Course in Functional Analysis, Springer - Verlag, New York, 1990.
- E. Kreyszig, Introductory Functional analysis with Applications, John Wiley & sons, New York, 1978

DISCRETE MATHEMATICAL STRUCTURES

Course Code: **MAM 303** **Credit Units: 04**

Course Objective:

Discrete structure is the study of the logical and algebraic relationships between discrete objects. At the end of the course, students will be able to relate computing theory with applications, understand and design finite state machine, understand the importance of graph algorithms

Course Contents:

Module I

Lattices: Lattices as partially ordered sets, their properties, duality, Lattices as algebraic systems, Sub lattices, Direct products, Bounded Lattices, Complete Lattices, Complemented Lattices and Distributive lattices. Cover of an elements, atoms, join and meet irreducible elements.

Module II

Boolean Algebras: Boolean Algebras as lattices. Various Boolean Identities. The Switching Algebra example. Sub algebras, Direct products and Homeomorphisms. Boolean forms and their Equivalence. Min-term Boolean forms, Sum of product Canonical forms. Minimization of Boolean functions, The Karnaugh Map method.

Module III

Definition of (undirected) graph, Walk, Path, Circuit, Cycles, Degree of a vertex, Connected graphs, Complete and Bipartite graphs, Planar graphs, Euler's formula for connected Planar graphs, Kuratowski's Theorem (Statement only) and its uses. Colouring of graphs, five color theorem and statement of four colour theorem.

Module IV

Trees , Cut-sets, Spanning Trees, Fundamentals Cut-sets and minimum Spanning Trees, Prim's and Kruskal's algorithms, Connectivity, Matrix Representation of graphs, Directed Graphs, Indegree and outdegree of a vertex.

Examination Scheme:

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

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

Text & References:

- J. P. Trembley & R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw-Hill Book Co., 1997.
- J. L. Gersting, Mathematical Structure for Computer Science (3rd ed.), Computer Science Press,
- Seymour Lepschutz, Finite Mathematics, McGraw-Hill Book Co. New –York.
- J. E. Hopcroft and J.D. Ullman, Introduction to Automata Theory Languages & Computation, Narosa Publishing House, Delhi.
- C. L. Liu, Elements of Discrete Mathematics, Tata McGraw-Hill Publishing Co. Ltd, New Delhi.
- N. Deo, Graph Theory with Applications to Engineering and Computer Sciences, Prentice Hall of India, New Delhi.

MATHEMATICAL METHODS

Course Code: **MAM 304** **Credit Units: 04**

Course Objective:

Mathematics abounds in various techniques for solving different type of problems of almost of all disciplines. The present course covers three important techniques namely, variation technique, Transforms and Integral equations methods for solving ordinary and partial differential equations involving initial and boundary value conditions.

Course Contents:

Module I

Functional and their Properties, Motivating problems of Calculus of Variation, Shortest Distance, Minimum Surface of Revolution, Branchistochrone problem, Isoperimetric problem, Geodesic problem Fundamental lemma of Calculus of Variation.

Module II

Euler's Equation for one dependent function and its generalization to n-dependent functions and to higher order derivatives, Variational problem with moving boundaries, Variation under constraints Rayleigh-Ritz method.

Module III

Integral Equation and their Classification, Relation between Integral and differential Equation, Fredholm and Volterra equations, Separable kernels, Reduction to a system of algebraic equations, Eigen values and Eigen functions.

Module IV

Iterated Kernels, Iterative Scheme for solving Fredholm Integral Equation of second kind (Neumann Series), Resolvent Kernel, Volterra Equations, Kernels and Functions, Volterra equation of first and second kind, Volterra integral equation and Linear Differential equation. Laplace Transform and its applications in solving Linear Differential Equations

Examination Scheme:

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

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

Text & References:

Text:

- F.B.Hilderbrand, Methods of Applied Mathematics, Prentice Hall of India, New Delhi.

References:

- V.Lovitt, Linear Integral Equation, Wiley Inter science New York.
- R.P. Kanwal, Linear Integral Equation Theory and Technique, Academic Press New York.
- L.Elsgols; Differential Equation and Calculus of Variation, Mir Publication, Moscow.

DOMAIN ELECTIVES

CRYPTOGRAPHY

Course Code: **MAM 305** **Credit Units: 04**

Course Objective:

The objective of this course is to make students aware of some tools for network security and the mathematics behind their construction and strength.

Course Contents:

Module I

Classical cryptography: Encryption schemes, Symmetric key encryption, Feistel ciphers, NDS, DES, Multiple encryptions, Modes of operation, Applications to authentication and identification.

Module II

Some Mathematical Tools: Algorithm, complexity, Modular arithmetic, Quadratic residues, Primality testing, Factoring and square roots, Discrete logarithm.

Module III

Public key Cryptography: Public key cryptosystems and their applications, RSA algorithm and its security, Key management, Diffie-Hellman key exchange, Elliptic curve cryptography.

Module IV

Advance Topics: Introductory concepts of Signcryption, ID based public key cryptosystems Certificate less public key cryptosystems.

Examination Scheme:

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

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

Text & References:

- D. R. Hankerson et al. Coding Theory and Cryptography (For Modules I and II), Monographs and Textbooks # 234, Marcel Dekker, 2000.
- W. Stallings Cryptography and Network Security (For unit III: Chapter 6), Prentice Hall India, 2000.

The following material from Internet (For Unit IV)

- Y. Zheng, Digital signcryption or How to achieve cost (signature + encryption) < cost (signature) + cost (encryption). Available at http://www.signcryption.org/publications/pdffiles/yz-c97-fnl-rvs.pdf
- D. Boneh and M. Franklin, Identity based encryption from Weil pairing. Available at http://eprint.iacr.org/2001/090.pdf
- S. S. Al-Riyami and K. G. Patterson, Certificate less public key cryptography. Available at http://eprint.iacr.org/2003/126.pdf

BIOMECHANICS

Course Code: **MAM 306** **Credit Units: 04**

Course Objective:

The main object of this paper is to study the mechanics of flow of blood in human beings and movement of insects, spread of viruses etc by using mathematical tools like ordinary differential equation, partial differential equation, Calculus of variation, Laplace Transforms etc .

Course Contents:

Module I

Mathematical Aspects of population biology; Some fundamental aspects, Models and their mathematical formulations, Single species models, Stability and classification of equilibrium points, Relationship between eigen values and critical points.

Module II

Introduction to Biological Fluid Mechanics: Basic concepts of Fluid Dynamics, Fluid Parameters, Viscosity, Navier Stokes Equations of viscous fluid motion, Poiseuille's flow, Model for blood flow, Properties of blood, Pulsatile Flow of blood, sedimentation.

Module III

Modeling through partial differential equations: simple models, mass balance equations, Variational principles, probability generating function, traffic flow problems, initial & boundary conditions.

Module IV

Study of alcohol in the blood stream; Volume of blood in human body; Stochastic epidemic model; Genetic graphs; Food webs: Linear programming in forest management; Mathematics in fisheries; Case studies on anchovy wipe out;

Examination Scheme:

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

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

Text & References:

- Belinda Barnes, ‘Mathematical modeling’
- J.N. Kapur, ‘Mathematical modeling’, New Age International Publishers, New Delhi

CLASSICAL MECHANICS

Course Code: **MAM 307** **Credit Units: 04**

Course Objective:

A detailed exposition of classical mechanics for the student, opting for physics is so vitally important for a clear understanding of recent intricate theories of quantum mechanics, modern physics and research for they are built an well developed and conceptualized foundation.

Course Contents:

Module I: Lagrangian Formulation

Mechanics of a system of particles, constraints, D'Alembert's principle, Variational calculus and its applications, Lagrangian equations, conservation theorems and symmetry properties, applications of Lagrangian formulation.

Module II: Central Force Problem

Reduction to one body problem, equation of motion and first integral, one dimensional problem and classification of orbits, Differential equation for the orbit, Kepler problem and planetary motion, Rutherford formula, scattering in central force field, transformation to laboratory frames.

Module III: Rigid Body and Vibrating System

Euler angles, tensor of inertia, kinetic energy of a rotating body, symmetric top and applications. Vibrating string, solution wave equation, normal vibrations, dispersion, coupled vibrating system.

Module IV: Hamiltonian Formulation

Hamiltonian equation of motion, the equations of canonical transformations,cyclic coordinates, phase space and Liouville's theorem, Poisson bracket.

Examination Scheme:

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

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

Text & References:

- H. Goldstein, Classical Mechanics, 2nd edition, Narosa Publishing House (1994).
- W. Greiner, Classical Mechanics, Springer-Verlag (2003).
- Introduction to classical mechanics – R.G.Takwall and P.S.Puranik, Tata – McGraw Hill, 1980, New Delhi.
- Classical mechanics – N.C.Rana and P.S.Joag, Tata McGraw Hill, 1991, New Delhi.

PARTIAL DIFFERENTIAL EQUATIONS

Course Code: MAM 308 **Credit Units: 04**

Course Objective:
This course aims to acquaint the students with various mathematical techniques for classification of PDE and their solutions. The students will be taught Transport equation, Laplace‟s equation, Heat equations, Green‟s function, wave equations and the approach to solve various boundary value problems involving parabolic, elliptic and hyperbolic differential equations which arise in many physical situations.

Course Contents:

Module I
Partial Differential Equation (PDE) of first order, origin of first order PDE & their classification, classifications of integrals. The Cauchy problem integral surfaces passing through given curve. Charpit‟s method, Jacobi‟s method.

Module II
Second order PDE with constant coefficients, Linear second order PDE with variable coefficients, classification of second order PDE, reduction to canonical forms. Homogeneous PDE

Module III
Transport Equation, Quasi linear equation, Laplace‟s equation, Analytic solutions of Laplace Equation in 2D Cartesian and polar coordinates, Interior & Exterior Dirichlet‟s problem, Neumann problem, Heat equation, solution by method of characteristics, solution by separation of variables.

Module IV
D‟Alembert solution of one dimensional homogeneous un-damped wave equation, initial value problems, solution of wave equation for infinite string, semi infinite string, finite string problems, Solution of one dimensional damped wave equation, Solution by method of separation of variable

Module V
Non linear first order PDE, generalizations, Non linear waves and shocks, conservation laws and shocks, The Rankine Hugonit conditions, Nonlinear diffusion equation, Burger‟s equation, The Hopf-Cole Transformation.

Examination Scheme:

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

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

Text & References:
1. L.C. Evans, Partial Differential Equations, Graduate studies in Mathematics, Volume 19, AMS, 1998
2. N. Sneddon, Partial Differential Equation, Tata McGraw Hill, New Delhi, 1983
3. T. Amarnath, An elementary course in Partial Differential Equations, second edition, Narosa Publishing House, New Delhi
4. G. Donald, Introduction to Partial Differential Equations, Tata Mc Graw Hill, New Delhi, 1961.

LEBESGUE MEASURE THEORY

Course Code: MAM 309 **Credit Units: 04**

Course Objective:

The objective of the present course is to introduce some advanced measure theory concept commonly used in research to the post graduate students.

Course Contents:

Module I:
Semi-algebra, Algebra, Monotone class, Sigma-algebra, Monotone class theorem. Measure spaces. Extension of measures from algebras to the generated sigma-algebras: Measurable sets; Lebesgue Measure and its properties.

Module II:
Measurable functions and their properties; Integration and Convergence theorems. Introduction to L_p-spaces, Riesz-Fischer theorem; Riesz Representation theorem for L_2 spaces. Absolute continuity of measures, Radon-Nikodym theorem. Dual of L_p-spaces.

Module III:
Product Measure. Product measure spaces, Fubini's theorem. Differentiation of integrals, absolutely continuous functions.
Fundamental Theorem of Calculus for Lebesgue Integrals

Examination Scheme:

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

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

Text & References:
1. Inder K. Rana, An Introduction to Measure and Integration (2nd ed.), Narosa Publishing House, New Delhi, 2004.
2. H.L. Royden, Real Analysis, 3rd ed., Macmillan, 1988.
3. G.De.Barra, Measure theory and integration.
4. P. Billingsley, Probability and Measure. John Wiley and Sons, Inc.,1995.

INFORMATION THEORY

Course Code: **MAM 310** **Credit Units: 04**

Course Objective:

This course is an introduction to Information Theory. It covers the most important results Concerning data compression and reliable communication over a communication channel and error control coding. After learning this course, the students shall be able to understand basic, notion of information and channel capacity, convolution and block codes, decoding technique and automatic repeat request scheme. Side by side, they will learn fundamentals of cryptography.

Course Contents:

Module I: Measure of Information & Noiseless Coding

Axioms for the uncertainty measure, Properties of the Uncertainty function – Joint & Conditional uncertainty, the measure of information, Noiseless Coding, Problem of unique decipherability, Necessary & Sufficient conditions for existence of instantaneous codes, Noiseless coding theorem, Construction of optimal codes

Module II: The Discrete Memory less Channels

Models for communication channels, Information processed by channels, Channel Capacity, Classification of channels, calculation of channel capacity, Decoding schemes; the ideal observer, Fundamental Theorem, Exponential Error Bounds, Weak converse to the Fundamental Theorem.

Module III: Error correcting codes

Minimum Distance Principle, Relation between distance and error correcting properties of codes, Error bounds for general binary codes, Binary symmetric channels, Non-binary coding, Properties of cyclic codes, Single error correcting cyclic codes, Automatic Decoding

Module IV: Channel with Memory & Continuous Channels

Finite-state channels, Finite State Channel, The Coding Theorem for finite state Regular Channels, The capacity of a general discrete channel; Comparison of the weak and Strong converses, The time discrete Gaussian Channels, Uncertainty in the continuous case, Converse to the coding theorem for the time-discrete Gaussian Channel, The time-continuous Gaussian Channel, Band-limited Channels.

Examination Scheme:

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

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

Text & References:

- F. M. Reza, An Introduction to Information Theory, McGraw Hill Book Inc.1961
- R. Ash , Information Theory, Weley Interscience, New York, 1995
- J M Aczel and Z Daroczy, On Measures of Information and their characterizations, Academic Press, New York.
- T. M. Cover and J. A. Thomas, Elements of Information Theory, 2nd ed. Wiley-Interscience, 2006.
- R. G. Gallager, Information Theory and Reliable Communication. Wiley, 1968.
- T. S. Han, Information-Spectrum Methods in Information Theory. Springer, 2002.

COMMUNICATION SKILLS - III

Course Code: **BCS 311** **Credit Units: 01**

Course Objective:

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

Course Contents:

Module I: Non Verbal Communication

Principles & Significance (Uses of Slides wherever necessary)

Kinesics, Occulics, Proxemics,, Para Linguistics, Artifacts, Chroenemics, Tactilics

Module II: Developing Writing Skills

Business Letter/Official Correspondence

Social Correspondence

Emails & Netiquette

Module III: Business Presentations

Planning, design and layout of presentation

Contents: Information Packaging & Delivery

Examination Scheme:

Components	CT	A	Group Presentation	Group Discussion	End Term Written Exam
Weightage (%)	10	05	15	10	60

Text & References:

- Jones, Working in English, 1st ed. Cambridge, CUP 2001
- Raman Prakash Business Communication, 2nd ed. Delhi OUP 2006
- Comfort , Jermy Speaking Effectively, Jermy, et.al, Cambridge, CUP, 1994
- Soft skills for everyone, Jeff Butterfield, Cengage Learning. 2011

BEHAVIOURAL SCIENCE - III
(LEADING THROUGH TEAMS)

Course Code: **BSS 311** **Credit Units: 01**

Course Objective:

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

Course Contents:

Module I: Teams: An Overview
Team Design Features: team vs. group

Effective Team Mission and Vision

Life Cycle of a Project Team

Rationale of a Team, Goal Analysis and Team Roles

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

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

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

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

Module VI: End-of-Semester Appraisal

Viva based on personal journal
Assessment of Behavioural change as a result of training

Exit Level Rating by Self and Observer

Examination Scheme:

Components	SAP	IWT (CT)	JFS	A	End Term Written Exam
Weightage (%)	10	10	15	05	60

SAP: Social Awareness Progammes; IWT: Internal Written Test; JFS: Journal Success; A: Attendance

Text & References:

- **Organizational Behaviour, Davis, K.**
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,Harcourt College Publishers
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- Dick, Mc Cann & Margerison, Charles: Team Management, 1992 Edition, viva books
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers

FRENCH - III

Course Code: **FLF 311** **Credit Units: 02**

Course Objective:

To provide the students with the know-how

- To master the current social communication skills in oral and in written.
- To enrich the formulations, the linguistic tools and vary the sentence construction without repetition.

Course Contents:

Module B: pp. 76 – 88 Unité 6

Module C: pp. 89 to103 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:

Components	**CT**	**A**	**Assignment**	**Class Performance/ Presentation/ Viva**	**End Term Written Exam**
Weightage (%)	10	05	10	15	60

Text & References:

- le livre à suivre: Campus: Tome 1

GERMAN - III

Course Code: **FLG 311** **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:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam
Weightage (%)	10	05	10	15	60

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 – III

Course Code: **FLS 311** **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:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam
Weightage (%)	10	05	10	15	60

Text & References:

- Español, En Directo I A
- Español Sin Fronteras -Nivel Elemental

JAPANESE - III

Course Code: **FLJ 311** **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:

Components	CT	A	Assignment	Class Performance/ Presentation/ Viva	End Term Written Exam
Weightage (%)	10	05	10	15	60

Text & References:

Text:

- Teach yourself Japanese

References:

- Shin Nihongo no kiso 1

CHINESE – III

Course Code: **FLC 311** **Credit Units: 02**

Course Objective:

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

Course Contents:

Module I

Drills

Dialogue practice

Observe picture and answer the question.

Introduction of written characters.

Practice reading aloud

Practice using the language both by speaking and by taking notes.

Character writing and stroke order

Module II

Measure words

Position words e.g. inside, outside, middle, in front, behind, top, bottom, side, left, right, straight.

Directional words – beibian, xibian, nanbian, dongbian, zhongjian.

Our school and its different building locations.

What game do you like?

Difference between “hii” and “neng”, “keyi”.

Module III

Changing affirmative sentences to negative ones and vice versa

Human body parts.

Not feeling well words e.g.; fever, cold, stomach ache, head ache.

Use of the modal particle “le”

Making a telephone call

Use of “jiu” and “cal” (Grammar portion)

Automobiles e.g. Bus, train, boat, car, bike etc.

Traveling, by train, by airplane, by bus, on the bike, by boat.. etc.

Module IV

The ordinal number “di”

“Mei” the demonstrative pronoun e.g. mei tian, mei nian etc.

use of to enter to exit

Structural particle “de” (Compliment of degree).

Going to the Park.

Description about class schedule during a week in school.

Grammar use of “li” and “cong”.

Comprehension reading followed by questions.

Module V

Persuasion-Please don’t smoke.

Please speak slowly

Praise – This pictorial is very beautiful

Opposites e.g. Clean-Dirty, Little-More, Old-New, Young-Old, Easy-Difficult, Boy-Girl, Black-White, Big-Small, Slow-Fast … etc.

Talking about studies and classmates

Use of “it doesn’t matter”

Enquiring about a student, description about study method.

Grammar: Negation of a sentence with a verbal predicate.

Examination Scheme:

Components	**CT**	**A**	**Assignment**	**Class Performance/ Presentation/ Viva**	**End Term Written Exam**
Weightage (%)	10	05	10	15	60

Text & References:

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

FOURTH SEMESTER

PROJECT

Course Code: **MAM 460**

GUIDELINES FOR PROJECT FILE AND PROJECT REPORT

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 critically analyzed by the faculty guide and corrected by the student at each stage.

PROJECT FILE

The Project File may be a very useful tool for undertaking an assignment along-with a normal semester, an exploratory study, sponsored projects, a project undertaken during summer period or any other period as per curriculae where the researcher is working with a company/organization. The project/ assignment may also be a part of the bigger research agenda being pursued by a faculty/ institution/ department

The Project File is the principal means by which the work carried out will be assessed and therefore great care should be taken in its preparation. This file may be considered in continuous assessment.

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 objectives;
- 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 and may be useful to document for future reference.

PROJECT REPORT

The Project Report is the final research report that the student prepares on the project assigned to him. In case of sponsored project the lay out of the project could be as prescribed by the sponsoring organization. However, in other cases the following components should be included in the project report:

- **Title or Cover Page**
  The title page should contain Project Title; Student's Name; Programme; Year and Semester and Name of the Faculty Guide.

- **Acknowledgement(s)**
  Acknowledgment to any advisory or financial assistance received in the course of work may be given. It is incomplete without student's signature.

- **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. It should not exceed more than 1000 words.

- **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 (wherever applicable). Methodology should be mentioned in details including modifications undertaken, if any. It includes organization site(s), sample, instruments used with its validation, procedures followed and precautions.

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

  Note that in writing the various secions, all figures and tables should as far as possible be next to the associated text, in the same orientation as the main text, numbered, and given appropriate titles or captions. All major equations should also be numbered and unless it is really necessary, do not write in "point" form.

While presenting the results, write at length about the the various statistical tools used in the data interpretation. The result interpretation should be simple but full of data and statistical analysis. This data interpretation should be in congruence with the written objectives and the inferences should be drawn on data and not on impression. Avoid writing straight forward conclusion rather, it should lead to generalization of data on the chosen sample.

Results and its discussion should be supporting/contradicting with the previous research work in the given area. Usually one should not use more than two researches in either case of supporing or contradicting the present case of research.

- **Conclusion(s) & Recommendations**

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

Check that your work answers the following questions:

- Did the research project meet its aims (check back to introduction for stated aims)?
- What are the main findings of the research?
- Are there any recommendations?
- Do you have any conclusion on the research process itself?

- **Implications for Future Research**

This should bring out further prospects for the study either thrown open by the present work or with the purpose of making it more comprehensive.

- **Appendices**

The Appendices contain 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**

References should include papers, books etc. referred to in the body of the report. These should be written in the alphabetical order of the author's surname. The titles of journals preferably should not be abbreviated; if they are, abbreviations must comply with an internationally recognised system.

Examples:

For research article:

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

For book:

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

The Layout Guidelines for the Project File & Project Report:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

ASSESSMENT OF THE PROJECT FILE AND THE PROJECT REPORT

Essentially, the assessment will be based on 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 Project should fulfill the following ***assessment objectives:***

- Range of Research Methods used to obtain information
- Execution of Research
- Data Analysis (Analyze Quantitative/ Qualitative information)
- Quality Control
- Conclusions

Assessment Scheme:

Continuous Evaluation: 40% (Based on punctuality, regularity of work, adherence to plan and methodology, refinements/ mid-course corrections etc. as reflected in the Project File.)

Final Evaluation: 60% (Based on the Documentation in the file, Final report layout, analysis and results, achievement of objectives, presentation/ viva)

It is recommended that the Final evaluation should be carried out by a panel of evaluators.