

**FATIMA MATA NATIONAL COLLEGE**  
**(AUTONOMOUS)**  
**KOLLAM**



**SCHEME & SYLLABUS OF**  
**B.Sc.Mathematics**  
**2015 Admission Onwards**





## Structure of Courses

<u>Courses</u>	<u>Course Code</u>	<u>Course Title</u>	<u>Instructional Hours per Week</u>	<u>Credits</u>
<b>Semester I</b>				
Language Course I	15UEN111.1	Listening and Speaking Skills	5	4
Language Course II	15UML/HN/FR111.1	Additional Language I	4	3
Foundation Course I	15UEN121	Writing on Contemporary Issues	4	2
Core Course I	15UMM141	Methods of Mathematics	4	4
Complementary Course I	15UST131.1	Descriptive Statistics and Introduction to Probability	4	2
Complementary Course II	15UPY131.1	Mechanics & Properties of Matter	2	2
<b>Semester II</b>				
Language Course III	15UEN211.1	Reading Skills	5	4
Language Course IV	15UEN212.1	Modern English Grammar & Usage	4	3
Language Course V	15UML/HN/FR211.1	Additional Language II	4	3
Foundation Course II	15UMM221	Foundation of Mathematics	4	3
Complementary Course III	15UST231.1	Analysis of Bivariate data and Introduction to Random Variables	4	2
Complementary Course IV	15UPY231.1	Heat & Thermodynamics	2	2
<b>Semester III</b>				
Language Course VI	15UEN311.1	Writing & Presentation Skills	5	4
Language Course VII	15UML/HN/FR311.1	Additional Language III	5	4
Core Course II	15UMM341	Calculus and Analytic Geometry	5	4
Complementary Course V	15UST331.1	Probability Distribution and Theory of Estimation	5	3
Complementary Course VI	15UPY331.1	Optics, Magnetism & Electricity	3	3
<b>Semester IV</b>				
Language Course VIII	15UEN411.1	Reading in Literature	5	4
Language Course IX	15UML/HN/FR411.1	Additional Language IV	5	4
Core Course III	15UMM441	Calculus and Trigonometry	5	4
Complementary Course VII	15UST431.1	Testing of Hypotheses and Analysis of Variance	5	3
Complementary Course IX	15UST432.1	Practical using Computer (Excel)	-	4
Complementary Course VIII	15UPY431.1	Modern Physic & Electronics	3	3
Complementary Course X	15UPY432.1	Practical		4

<b>Semester V</b>				
Core Course IV	15UMM541	Real Analysis I	5	4
Core Course V	15UMM542	Complex Analysis I	4	3
Core Course VI	15UMM543	Differential Equations	3	3
Core Course VII	15UMM544	Vector Analysis	3	3
Core Course VIII	15UMM545	Abstract Algebra I	5	4
Open Course		Open Course	3	2
Project		Project	2	-
<b>Semester VI</b>				
Core Course IX	15UMM641	Real Analysis II	5	4
Core Course X	15UMM642	Linear Algebra	4	3
Core Course XI	15UMM643	Complex Analysis II	3	3
Core Course XII	15UMM644	Abstract Algebra II	3	3
Core Course XIII	15UMM645	Computer Programming (Practical)	5	4
Elective Course	15UMM661.1 15UMM661.2 15UMM661.3	1.Graph Theory 2.Fuzzy Mathematics 3.Mechanics	3	2
Project	15UMM646	Project	2	4

<u>Courses</u>	<u>Course Code</u>	<u>Course Title</u>	<u>Instructional Hours per Week</u>	<u>Credits</u>
<b>Open Courses</b>				
Open Course	15UMM551.1	Operations Research	3	2
Open Course	15UMM551.2	Business Mathematics	3	2
Open Course	15UMM551.3	Actuarial Science	3	2



















## SEMESTER I

### Language Course I

#### 15UEN111.1: LISTENING AND SPEAKING SKILLS

**No. of credits: 4**

**No. of instructional hours per week: 5 (Total 90 hrs.)**

#### AIMS

1. To familiarize students with English sounds and phonemic symbols.
2. To enhance their ability in listening and speaking.

#### OBJECTIVES

On completion of the course, the students should be able to

1. listen to lectures, public announcements and news on TV and radio.
2. engage in telephonic conversation.
3. communicate effectively and accurately in English.
4. use spoken language for various purposes.

#### COURSE OUTLINE

##### Module 1

Pronunciation Phonetic symbols – consonants – vowels – syllables - word stress - strong and weak forms.

##### Module 2

**Listening Skills** Difference between listening and hearing – active listening – barriers to listening – academic listening - listening for details - listening and note-taking - - listening to talks and descriptions - - listening to announcements - listening to news programmes.

##### Module 3

**Speaking Skills** Interactive nature of communication - importance of context - formal and informal - set expressions in different situations –greeting – introducing - making requests - asking for / giving permission - giving instructions and directions – agreeing / disagreeing – seeking and giving advice - inviting and apologizing telephonic skills - conversational manners.

##### Module 4

##### **Dialogue Practice**

(Students should be given ample practice in dialogue, using core and supplementary materials.

#### COURSE MATERIAL

##### Modules 1 – 3

Core reading: *Listening and Speaking*, Cambridge University Press, India Pvt Ltd, 2010

**Further reading:**

1. Marks, Jonathan. English Pronunciation in Use. New Delhi: CUP, 2007.
2. Lynch, Tony. Study Listening. New Delhi: CUP, 2008.
3. Kenneth, Anderson, Tony Lynch, Joan MacLean. Study Speaking. New Delhi: CUP, 2008.

**Module 4:**

Core reading: *Dramatic Moments: A Book of One Act Plays*. Orient Black Swan, 2013.

**The following One-act plays prescribed:**

1. Saki - The Death Trap
2. Philip Moeller - Helena's Husband
3. Serafin and Joaquin Alvarez Quintero - Sunny Morning: A Comedy of Madrid
4. Margaret Wood - Day of Atonement

**Reference:**

Jones, Daniel. *English Pronouncing Dictionary* 17th Edition. New Delhi: CUP, 2009.

**Language Course II (Additional Language I)**

**15UML111.1: മലയാള കവിത**

**No. of credits: 3**

**No. of instructional hours per week: 4**

പുസ്തകം : കാവ്യപഥം

(കോളേജ് പ്രസിദ്ധീകരണം)

പഠനോദ്ദേശ്യം : മലയാള കവിതയെ സംബന്ധിച്ച് സാമാന്യജ്ഞാനം നൽകുക. പഠിതാക്കളിൽ കാവ്യഭിരുചി വളർത്തുക. ആസ്വാദനത്തിനും വിശകലത്തിനും സജ്ജരാക്കുക.

**പാഠ്യപദ്ധതി :**

**മൊഡ്യൂൾ ഒന്ന് (18 മണിക്കൂർ)**

- 1. ചെറുശ്ശേരി - വേണുഗാനം  
(രാഗങ്ങളോരോന്നേ ഗോകുലനായകൻ.....  
മുതൽ അവസാനം വരെ)
- 2. എഴുത്തച്ഛൻ - പാർത്ഥസാരഥീവർണ്ണന
- 3. വടക്കൻ പാട്ട് - ഉണ്ണിയാർച്ചയുടെ അപേക്ഷ
- 4. കുമാരനാശാൻ - കരുണ (ആദ്യത്തെ 100 വരി)

**മൊഡ്യൂൾ രണ്ട് (18 മണിക്കൂർ)**

- 5. പി.കുഞ്ഞിരാമൻ നായർ - കൊടുത്തു മുടിഞ്ഞ മാവ്
- 6. ചങ്ങമ്പുഴ - രമണൻ (രംഗം - 5 മുഴുവൻ)
- 7. വൈലോപ്പിള്ളി - കൃഷ്ണാഷ്ടമി
- 8. ഇടശ്ശേരി - കറുത്ത ചെട്ടിച്ചികൾ

**മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)**

- 9. വയലാർ - രാവണപുത്രി
- 10. ഒ.എൻ.വി - പാഥേയം
- 11. സുഗതകുമാരി - തുലാവർഷപ്പച്ച
- 12. അയ്യപ്പപ്പണിക്കർ - പകലുകൾ രാത്രികൾ

**മൊഡ്യൂൾ നാല് (18 മണിക്കൂർ)**

- 13. കടമ്മനിട്ട രാമകൃഷ്ണൻ - കടമ്മനിട്ട
- 14. ബാലചന്ദ്രൻ ചുള്ളിക്കാട് - ഗസൽ
- 15. പി.പി. രാമചന്ദ്രൻ - ലൈബ്രേറിയൻ മരിച്ചതിൽപ്പിന്നെ
- 16. റഫീക് അഹമ്മദ് - തോരാമഴ
- 17. എസ്. ജോസഫ് - പെങ്ങളുടെ ബൈബിൾ

18. വി.എം. ഗിരിജ - ജീവജലം

**സഹായകഗ്രന്ഥങ്ങൾ**

1. ആധുനിക സാഹിത്യ ചരിത്രം  
പ്രസ്ഥാനങ്ങളിലൂടെ - ഡോ.കെ.എം.ജോർജ്ജ് (എഡിറ്റർ)
2. കൈരളിയുടെ കഥ - എൻ. കൃഷ്ണപിള്ള
3. മലയാള കവിതാസാഹിത്യ ചരിത്രം - ഡോ.എം. ലീലാവതി
4. കവിയും കവിതയും രണ്ടാം വാലും - പി.നാരായണക്കുറുപ്പ്
5. കവിയരങ്ങ് - കെ.എസ്. നാരായണപിള്ള
6. കുമാരനാശാന്റെ കാവ്യപ്രപഞ്ചം - മലയാളവിഭാഗം,  
കേരള സർവ്വകലാശാല
7. ഖണ്ഡകാവ്യ പ്രസ്ഥാനം - എം.വി. പണിക്കർ
8. ചങ്ങമ്പുഴ കൃഷ്ണപിള്ള - എൻ.മുകുന്ദൻ
9. ചങ്ങമ്പുഴ കൃഷ്ണപിള്ള  
നക്ഷത്രങ്ങളുടെ സ്നേഹ ഭാജനം - എം.കെ.സാനു
10. കുമാരനാശാന്റെ രചനാശിൽപ്പം - എം.എം. ബഷീർ
11. കാല്പനികത - ഹൃദയകുമാരി
12. ആധുനിക മലയാളസാഹിത്യം - പി.കെ. പരമേശ്വരൻ  
നായർ
13. ഇടശ്ശേരിക്കവിത - മേലത്തു ചന്ദ്രശേഖരൻ
14. സിംബലിസം മലയാളകവിതയിൽ - ഡോ.കെ.എം. വേണു  
ഗോപാൽ
15. ആധുനികത മലയാളകവിതയിൽ - ഡോ.എൻ.അജയകുമാർ
16. കേരളകവിതയിലെ കലിയും ചിരിയും - പ്രസന്നരാജൻ
17. ഉത്തരാധുനികത - ബി.ഉണ്ണികൃഷ്ണൻ



- |   |   |                              |
|---|---|------------------------------|
| 18. മലയാളകവിതാപഠനങ്ങൾ                         | - | സച്ചിദാനന്ദൻ                 |
| 19. മലയാളകവിതയിലെ ഉയർന്നശിരസ്സുകൾ             | - | ഡോ.എം.എൻ. രാജൻ               |
| 20. കടമ്മനിട്ടയിലെ കവി                        | - | ഡോ.കെ.എസ്.രവികുമാർ           |
| 21. ദലിത് പഠനം സ്വത്വം,സംസ്കാരം സാഹിത്യം      | - | ഡോ. പ്രദീപൻ പാമ്പിരിക്കുന്ന് |
| 22. ആധുനിക മലയാള കവിതയിലെ സ്ത്രീപക്ഷസമീപനങ്ങൾ | - | ഡോ.പി.ഗീത                    |
| 23. പാഠങ്ങൾ പഠനങ്ങൾ                           | - | സച്ചിദാനന്ദൻ                 |
| 24. കവിതവായനയും പ്രതികരണവും                   | - | എൻ.രാജൻ                      |
| 25. കവിതയിലെ പുതുവഴികൾ                        | - | നെല്ലിക്കൽ മുരളീധരൻ          |

## Language Course II (Additional Language I)

### 15UHN111.1: PROSE AND GRAMMAR

**No. of credits: 3**

**No. of instructional hours per week: 4**

**Aim of the Course / Objectives**

The aim of the course is to sensitize the students to the aesthetic and cultural aspects of literary appreciation and analysis. To introduce Modern Hindi prose to the students and to understand the cultural, social and moral values of modern Hindi prose. To understand the theory and practice of Hindi Grammar.

**Module I**

Prose (Prescribe a prose collection)

## **Module 2**

### **Grammar**

Parts of speech – varna – Noun – Lingavachan, karak – Pronoun – Adjective – Verb – Tense, voice Grammar Practice – Sentence Correction – Change of Tense – ‘Ne’ rule.

### **Prescribed Textbooks**

1. Pose (Detailed) - Gadya Prabha Edited by Dr. Alok Gupta  
Published by Rajpal and sons Kasmiri Gate,  
Delhi-6.

### **Lessons to be studied**

1. Tyagamoorthy Nirala - Sivapoojan Sahay
2. Bharatheey Sanskriti - Rajendra Prasad
3. Holi aur Onam - Dr. N.E.V. Iyer
4. Ve Bahaduri se Bike - Harisankar Parsay
5. Sukh - Kaseenath Singh
6. Nadiya gahari naav purani - Amritlal Vegad
2. Grammar - Vyavaharik Hindi Vyakaran  
By Dr. H. Parameswaran  
Radhakrishna Prakasan, Delhi

### **Topics to be studied**

Varna, Sangya - Ling-vachan-karak, Sarvanam, Visheshan, kriya – kaal – kaal ke prakar – ne prathyay and vachya only.

**Language Course II (Additional Language I)**  
**15UFR111.1: Communication skills in French**

**No. of credits: 3**

**No. of instructional hours per week: 4**

**AIMS:**

The aim of the course is to emphasis on conversational French and to develop the communication skills of the students.

**OBJECTIVES:**

1. To familiarise the students with a modern foreign language.
2. To familiarise the students with the sounds of French.
3. To encourage students to use French for basic communication in everyday situation.
4. To acquaint students with the basics of writing simple sentences and short compositions.

**SYLLABUS:**

NAME OF TEXT: **CONNEXIONS** – Niveau 1 By Régine Mérieux and Yves Loiseau

Publisher : Didier

Module 1 : Parler de soi

Unit 1 : Bonjour !

Unit 2 : Rencontres

Unit 3 : 100% questions

Reference books :

1. Le Nouveau Sans Frontières Vol I by Philippe Dominique
2. Panorama Vol I by Jacky Girardet
3. Cours de langue et de civilisation française Vol I (Mauger Bleu)

**Foundation Course I**

**15UEN121: WRITINGS ON CONTEMPORARY ISSUES**

**No. of credits: 2**

**No. of instructional hours per week: 4 (Total 72 hrs.)**

**AIMS**

1. To sensitize students to the major issues in the society and the world.
2. To encourage them to read literary pieces critically.

## **OBJECTIVES**

On completion of the course, the students should be able to

1. have an overall understanding of some of the major issues in the contemporary world.
2. respond empathetically to the issues of the society.
3. read literary texts critically.

## **COURSE OUTLINE**

### **Module I: Globalization and its Consequences**

Essays: (1) "The Globalized World" – Avinash Jha.  
(2) "Globalization and Education: Third World Experience" – AmitBhaduri.

Poem: "Unending Love" - Rabindranath Tagore

### **Module II: Environmental Issues**

Essay: "Forests and Settlements" - Romila Thapar Poems:

- (1) "God's Grandeur" - G.M.Hopkins
- (2) "The World is too Much with Us" – Wordsworth

### **Module III: Human Rights**

Essay: "Thinking about Human Rights" - Manisha Priyam, Krishna Menon&Madhulika Banerjee

Poem: "London" - William Blake

Fiction: Untouchable [an extract] – Mulk Raj Anand

### **Module IV: The Gender Question**

Essays: "Gender, Culture and History" – Manisha Priyam, Krishna Menon&Madhulika Banerjee

Fiction: "The Elder Sister" – M. T. Vasudevan Nair

## **COURSE MATERIAL**

### **Modules 1 - 4**

Core reading: *Meeting the World: Writings on Contemporary Issues*.  
Pearson, 2013.

## **Core Course I**

### **15UMM141: Methods of Mathematics**

**No. of credits: 4**

**No. of instructional hours per week: 4**

#### **Module 1 - Theory of Equations**

Text :Bernard and Child, Higher Algebra, Enlarged edition, 2012

Roots of equations, cubic and bi-quadratic equations, Descarte's rule of signs, symmetric functions of roots, Multiple roots, Rolle's theorem and some

deductions, sum of powers of roots of an equation - Newton's theorem. It is based on chapter XVI and sections 1, 2, 3, 4 of XVIII

### **Module 2 - Calculus**

Text : Howard Anton, et al, Calculus, Seventh Edition, John Wiley

Basic ideas of differentiation, basic properties of functions, explicit and implicit definitions of functions and their graphs, functions defined piecewise and their graphs, symmetry, stretching, compression and translation, parametric equations especially that of cycloid, concept of limit and continuity, velocity and slopes, implicit differentiation.

It is based on chapters 1 - 3 of the text. (Sections 1.3,1.6, 1.7, 2.4, 3.8)

### **Module 3 - Analytic Geometry**

Text: S. L. Loney, The elements of co-ordinate geometry, (Part I Cartesian co-ordinates), G. K. Publishers

Standard equations of conics, condition for line  $y = mx + c$  to be a tangent to the standard parabola, ellipse and hyperbola, tangent and normal at the point  $(x_1, y_1)$  to the conics, number of tangents and normal from a point, chords in terms of given points, diameters, rectangular hyperbola.

It is based on chapter 10 to 13.

### **References:**

1. James Stewart, Essential Calculus, Thompson Publications, 2007.
2. Thomas and Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley.
3. S.Lang, A first Calculus, Springer.
4. S. L. Loney, Co-ordinate Geometry
5. H. S. Hall and S. R. Knight, Higher Algebra, Metric Edition, AITBS Publishers, 2002.

Distribution of instructional hours:

Module 1: 18 hours; Module 2: 36 hours; Module 3: 18 hours

## **Complementary Course I**

### **15UST131.1: Descriptive Statistics and Introduction to Probability**

**No. of credits: 2**

**No. of instructional hours per week: 4**

The course aims that students will learn to understand characteristics of statistical data and will get acquainted with describing data through illustrating

examples and exercises. They will also learn to collect, organize and summarize data, create and interpret simple graphs and compute appropriate summary statistics accurately.

**Module 1. Statistics -Introduction ( 20 hours)**

- 1.1 Nature and uses of Statistics in various disciplines, misuse and Limitations.
- 1.2 Scales of measurement- Nominal, ordinal, interval and ratio scales
- 1.3 Collection of data: Preparation of questionnaires and checking consistency of data and Pilot survey
- 1.4 Primary data and secondary data, Choice between primary and secondary data, Methods of collecting Primary data, merits and demerits of different methods of collecting Primary data, sources of secondary data, precautions in the use of secondary data.
- 1.5 Census and sampling methods , Simple Random Sampling , sampling and non-sampling errors
- 1.6 Meaning and objectives of Classification, Types of Classification- geographical Classification, chronological Classification, qualitative Classification and quantitative Classification.
- 1.7 Tabulation and different parts of a table. Frequency distribution, relative and cumulative frequency distributions.
- 1.8 One dimensional and two dimensional diagrams- Diagrammatic representation of data: Pictograms, Cartograms, stem and leaf chart and box plot. Graphical representation of frequency distribution: Histogram, frequency polygon, frequency curve and ogives

**Module 2 Descriptive Statistics ( 20 hours)**

- 2.1 Measures of Central tendency-Mean , Median, Mode, Geometric Mean, Harmonic mean and their properties
- 2.2 Measures of dispersion-absolute and relative measures -Range, Standard deviation(S.D), Quartile deviation(Q.D) & Average deviation(A.D), Coefficient of variation(C.V).
- 2.3 Partition values: Quartiles, deciles, quintiles, deciles, percentiles(Numerical problems).
- 2.4 Moments-raw and central, Sheppard's correction,
- 2.5 Skewness -Definition, measures of skewness-Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness, measure of skewness based on third moment.
- 2.6 Kurtosis-Definition , measure of kurtosis based on fourth central Moment & Quartiles

**Module 3 Random experiments (10 hours)**

- 3.1 Sample point and sample space-discrete and continuous
- 3.2 Events, operations of events, concepts of equally likely, mutually exclusive and exhaustive events.

**Module 4 Probability ( 22 hours)**

- 4.1 Probability-classical, axiomatic and relative frequency definitions.
- 4.2 Probability measure, probability space and theorems in probability
- 4.3 Addition and multiplication theorem of probability and conditional Probability, independence of two and three events and compound probability
- 4.4 Bayes' theorem and its applications

**Module 5 Numerical problem solving using scientific calculator and Computer (Excel) based on Modules 1, 2, 3 & 4**

Numerical problem solving using scientific calculator is included in the End Semester Examination( ESE) 15UST131.1 and Practical(numerical problems) using Computer(Excel) only for 15UST432.1 Practical Exam in semester IV

**References**

1. Bhat B,R (1985):Modern Probability Theory, New Age International(p)Ltd
2. Gupta S. C and Kapoor V.K (1980): Fundamentals of Mathematical Statistics, Sultan Chand and sons, New Delhi
3. Parimal Mukkppadhya(1996): Mathematical Statistics,New Central Book Agency(p)Ltd,Calcutta
4. Gupta S. P (1989): Statistical Methods, Sultan Chand and sons,Delhi
5. Kenny J.F &Keping E.S(1954):Mathematics of Statistics-Part I ,D Van nostrand & Company, New Delhi-1
6. Jim Pitman1996:Probability,Narosa Publishing House,New Delhi

**Complementary Course II**

**15UPY131.1: MECHANICS AND PROPERTIES OF MATTER**

**No. of credits: 2**

**No. of instructional hours per week: 2**

**Unit I (28 hours)**

**Dynamics of rigid bodies (6 hours)**

Theorems of M.I with proof-Calculation of M.I of bodies of regular shapes rectangular lamina, uniform bar of rectangular cross section, annular disc,

circular disc, solid sphere-K.E of a rotating body-Determination of M.I of a fly wheel (theory and experiment).

**Oscillations and waves (15 hours)**

Examples of S.H oscillator-compound pendulum-determination of g-torsion pendulum oscillations of two particles connected by a spring-vibration state of a diatomic molecule. Wave motion-general equation of wave motion-plane progressive harmonic wave energy density of a plane progressive wave-intensity of wave and spherical waves transverse waves in stretched string-modes of transverse vibrations of strings longitudinal waves in rods and in gases.

**Mechanics of solids (7 hours)**

Bending of beams-bending moment-cantilever-beam supported at its ends and loaded in the middle-uniform bending-experimental determination of Y using the above principles with pin and microscope-twisting couple on a cylinder-angle of twist and angle of shear-torsional rigidity.

**Unit II (8 hours);**

**Surface Tension (5 hours)**

Excess of pressure on a curved surface-force between two plates separated by a thin layer of liquid-experiment with theory to find surface tension and its temperature dependence by Jaeger's method-equilibrium of a liquid drop over solid and liquid surfaces.

**Viscosity (3 hours)**

Flow of liquid through a capillary tube-derivation of Poiseuille's formula-limitations-Ostwald's viscometer-variation of viscosity with temperature.

**References**

1. Mechanics: J.C.Upadhyaya, Ram Prasad & Sons
2. Oscillations & Waves: K.RamaReddy, S.Bbadami & V.Balasubramaniam (University Press)



**SEMESTER II**  
**Language Course III**  
**15UEN211.1: READING SKILLS**

**No. of credits: 4**

**No. of instructional hours per week: 5 (Total 90 hrs.)**

**AIMS**

1. To make students competent in advanced reading skills like skimming, scanning and reading for meaning and pleasure.
2. To make them familiar with the concepts of extensive and intensive reading.
3. To help them increase their active and passive vocabulary.
4. To help them broaden their mental vision.

**OBJECTIVES**

On completion of the course, the students should be able to

1. identify various text types and comprehend them.
2. apply reading techniques like skimming and scanning to understand the main arguments and themes and distinguish supporting details.
3. use and comprehend a reasonable vocabulary and reinforce their language proficiency.
4. have a broader outlook resultant from the exposure to the study of fine specimens of reading.

**COURSE OUTLINE**

**Module 1**

Intensive reading - reading for information - application of scanning and skimming – silent and loud reading - various techniques - advantages and disadvantages.(Pull Out - Reading Tips)

**Module 2**

Introducing students to different text types – poetry (Henry IV, Nobody, I Am, *Musee des Beaux Arts*, *Paradiese Lost*, *Heaven*, *Kubla Khan*, *Message Clear*)  
Drama (*Loot*, *Macbeth*, *Happy Days*)

**Module 3**

Introducing students to different text types - prose – fictional- (*Alice in Wonderland*, *Nineteen Eighty Four*, *Catch -22*, *Animal Farm*, *The Sacred and Profane Love Machine*)  
Nonfictional – (*Civilized Man*, *Our Bodies Ourselves*)

**Module 4**

Extensive reading – reading for pleasure and knowledge.(Poem – *Father and Son*, *The Poplar Field*, *Going Going*, *Anthem for Doomed Youth*, *A Refusal to Mourn*, *Ulysses*, *Andrea del Sarto*)  
Drama (*Chicken Soup with Barley*, *A Night Out*, *The Importance of Being Earnest*)

Prose –Fictional – (Sons and Lovers, Emma, Middlemarch, Down There on a Visit, Bleak House, The Picture of Dorian Gray)  
Non –fictional – (Churchill's Speech, Russell's Autobiography)

#### **COURSE MATERIAL**

##### **Modules 1 – 4**

Core reading: Reading Between the Lines. Cambridge University Press, India Pvt Ltd, 2010

##### **Further reading:**

1. Brown, Katherine and Susan Hood. Academic Encounters: Life in a Society. New Delhi: CUP, 2006.
2. Longman Essential Activator. London: Pearson Longman, 2009.
3. Glendinning, Eric H and Beverly Holmstrom. Study Reading. South Asian Edition. CUP, 2008.
4. Oxford Dictionary of Collocations in English, Oxford University Press, 2009.
5. Wainwright, Gordon. How to Read Faster and Recall More. Macmillan India Ltd, 2008.
6. McCarthy, Michael et al. English Collocation in Use. CUP, 2007.

##### **Reference:**

Mayor, Michael, et al, Ed. Longman Dictionary of Contemporary English. 5th Edition. London: Pearson Longman Ltd, 2009.

### **Language Course IV**

## **15UEN212.1: MODERN ENGLISH GRAMMAR AND USAGE**

**No. of credits: 3**

**No. of instructional hours per week: 4 (Total 72 hrs.)**

##### **AIMS:**

1. To help students have a good understanding of modern English grammar.
2. To enable them produce grammatically and idiomatically correct language.
3. To help them improve their verbal communication skills.
4. To help them minimise mother tongue influence.

##### **OBJECTIVES:**

On completion of the course, the students should be able to

1. have an appreciable understanding of English grammar.

2. produce grammatically and idiomatically correct spoken and written discourse.
3. spot language errors and correct them.

### **COURSE CONTENTS**

#### **Module 1:**

- Words - parts of speech – nouns – pronouns - adjectives verbs - adverbs – prepositions – conjunctions - determinatives.
- Sentence as a self-contained unit – various types of sentence – simple – compound – complex – declaratives – interrogatives – imperatives – exclamatives.
- Basic sentence patterns in English - constituents of sentences – subject – verb - object - complement – adverbials.
- Phrases - various types of phrases - noun, verb, adjectival and prepositional phrases.

#### **Module 2:**

- Nouns - different types - count and uncount – collective - mass - case - number – gender.
- Pronoun - different types - personal, reflexive - infinite-emphatic – reciprocal
- Adjectives - predicative - attributive - pre- and post-modification of nouns.
- Verbs - tense-aspect - voice -mood - Concord - types of verbs – transitive - intransitive-finite - non-finite
- Helping verbs and modal auxiliaries - function and use.

#### **Module 3:**

- Adverbs - different types - various functions - modifying and connective.
- Prepositions - different types - syntactic occurrences - prepositional phrases - adverbial function.
- Conjunctions - subordinating and coordinating Determinatives articles - possessives - quantifiers
- Clauses - main and subordinate clauses - noun clauses - relative clauses - adverbial clauses - finite and non-finite clauses - analysis and conversion of sentences – Active to Passive and vice versa – Direct to Indirect and vice versa – Degrees of Comparison, one form to the other.

#### **Module 4:**

- Written Composition – précis writing – outline story – Comprehension

## **COURSE MATERIAL**

Modules 1 - 4 Core Reading: Concise English Grammar by Prof. V. K. Moothathu. Oxford University Press, 2012.

### **Further Reading:**

1. Leech, Geoffrey et al. English Grammar for Today: A New Introduction. 2nd Edition. Palgrave, 2008.
2. Carter, Ronald and Michael McCarthy. Cambridge Grammar of English. CUP, 2006.
3. Greenbaum, Sidney. Oxford English Grammar. Indian Edition. Oxford University Press, 2005.
4. Sinclair, John ed. Collins Cobuild English Grammar. Harper Collins publishers, 2000.
5. Driscoll, Liz. Common Mistakes at Intermediate and How to Avoid Them. CUP, 2008.
6. Tayfoor, Susanne. Common Mistakes at Upper-intermediate and How to Avoid Them. CUP, 2008.
7. Powell, Debra. Common Mistakes at Advanced and How to Avoid Them. CUP, 2008.
8. Burt, Angela. Quick Solutions to Common Errors in English. Macmillan India Limited, 2008.
9. Turton. ABC of Common Grammatical Errors. Macmillan India Limited, 2008.
10. Leech, Geoffrey, Jan Svartvik. A Communicative Grammar of English. Third Edition. New Delhi: Pearson Education, 2009.

Direction to Teachers: The items in the modules should be taught at application level with only necessary details of concepts. The emphasis should be on how grammar works rather than on what it is. The aim is the correct usage based on Standard English and not conceptual excellence.

**Language Course V (Additional Language II)**

**15UML211.1: ഗദ്യസാഹിത്യം**

**No. of credits: 3**

**No. of instructional hours per week: 4**

**മൊഡ്യൂൾ ഒന്ന് (18 മണിക്കൂർ)**

**നോവൽ**

മലയാള നോവൽ പ്രസ്ഥാനത്തിന്റെ ഉത്ഭവ-വികാസപരിണാമങ്ങളെപ്പറ്റി സാമാന്യമായി മനസ്സിലാക്കുക. ഒരു നോവൽ വിശദമായി പഠിക്കുക

- 1. എം.മുകുന്ദൻ - ഒരു ദളിത് യുവതിയുടെ കദനകഥ

**മൊഡ്യൂൾ രണ്ട് (18 മണിക്കൂർ)**

**ചെറുകഥ**

മലയാള ചെറുകഥയുടെ വികാസപരിണാമങ്ങളെപ്പറ്റിയുള്ള സാമാന്യജ്ഞാനം. ആഖ്യാന തന്ത്രങ്ങളുടെ വൈചിത്ര്യം. പ്രമേയത്തിലും രൂപശില്പത്തിലും സംഭവിച്ച മാറ്റങ്ങൾ

- 1. സി.വി. കുഞ്ഞിരാമൻ - ആത്മഹത്യ ചെയ്യാൻ എനിക്ക് മതിയായ കാരണമില്ലയോ?
- 2. കാരൂർ - പൊതിച്ചോര്
- 3. ലളിതാംബിക അന്തർജ്ജനം - മനുഷ്യപുത്രി
- 4. കെ.സരസ്വതിയമ്മ - രമണി
- 5. എം.ടി - ബന്ധനം
- 6. സക്കറിയ - പത്രം
- 7. ടി.പത്മനാഭൻ - ദാസൻ
- 8. അഷ്ടമൂർത്തി - വിഡിയോ ചിത്രങ്ങൾ
- 9. സിതാര - അഗ്നി
- 10. ബി.മുരളി - ഐ.സി.യു

**മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)**

**ഉപന്യാസം, പഠനം, അനുഭവം**

സാഹിത്യവും സാഹിത്യേതരവുമായ 4 രചനകൾ പഠിക്കണം

- 1. എം.എൻ. വിജയൻ - മാമ്പഴം
- 2. സുകുമാർ അഴീക്കോട് - പ്രഭാഷണകല
- 3. കെ.പി.അപ്പൻ - മധുരം നിന്റെ ജീവിതം (ആദ്യഭാഗം)
- 4. സാറാജോസഫ് - അടുക്കളകൾ തിരിച്ച് പിടിക്കുക

റഫറൻസ് ഗ്രന്ഥങ്ങൾ

1. സമ്പൂർണ്ണ മലയാള സാഹിത്യ ചരിത്രം - എഡിറ്റർ പന്മന രാമചന്ദ്രൻ നായർ
2. കൈരളിയുടെ കഥ - എൻ. കൃഷ്ണപിള്ള
3. ആധുനിക സാഹിത്യ ചരിത്രം പ്രസ്ഥാനങ്ങളിലൂടെ - ഡോ.കെ.എം. ജോർജ്ജ്
4. മലയാളനോവൽ സാഹിത്യ ചരിത്രം - ഡോ.കെ.എം.തരകൻ
5. മലയാള ചെറുകഥാ സാഹിത്യചരിത്രം- ഡോ.എം.എം.ബഷീർ
6. നോവൽ സാഹിത്യം - കെ.സുരേന്ദ്രൻ
7. നോവൽ സ്വരൂപം - കെ.സുരേന്ദ്രൻ
8. നോവൽ സിദ്ധിയും സാധനയും - പി.കെ.ബാലകൃഷ്ണൻ
9. നോവൽ സാഹിത്യപഠനങ്ങൾ - ഡോ. ഡി.ബഞ്ചമിൻ
10. ആധുനിക നോവൽ ദർശനങ്ങൾ - കെ.എം. തരകൻ
11. ചെറുകഥാ പ്രസ്ഥാനം - എം.പി. പോൾ
12. ചെറുകഥ ഇന്നലെ, ഇന്ന് - എം. അച്യുതൻ
13. ചെറുകഥ - വാക്യംവഴിയും - കെ.എസ്.രവീകുമാർ
14. നോവൽ പഠനങ്ങൾ - ഡോ.പന്മന രാമചന്ദ്രൻ നായർ
15. ചെറുകഥാ പഠനങ്ങൾ - ഡോ.പന്മന രാമചന്ദ്രൻ നായർ
16. കഥയും ഫാൻസിയും - ഡോ.വത്സലൻ വാതുശ്ശേരി
17. കഥയിലെ ആത്മീയസഞ്ചാരങ്ങൾ - ഡോ.ഇ. രമാഭായി
18. കഥ അനുഭവവും ആഖ്യാനവും - ഡോ.കെ.പി.അപ്പൻ
19. കഥയും ഭാവുകത്വപരിണാമവും - ഡോ.കെ.എസ് രവീകുമാർ
20. ഏകാന്തനഗരങ്ങൾ - ഡോ.പി.കെ രാജശേഖരൻ
21. ഭാരതപര്യടനം - കുട്ടികൃഷ്ണമാരാർ
22. മധുരം നിന്റെ ജീവിതം - കെ.പി.അപ്പൻ
23. ശീർഷാസനം - എം.എൻ.വിജയൻ
24. കവിതയും മന:ശാസ്ത്രവും - എം.എൻ.വിജയൻ
25. അടുക്കളകൾ തിരിച്ചു പിടിക്കുക - സാറാ ജോസഫ്

**Language Course V (Additional Language II)**  
**15UHN211.1: Fiction and Literary Analysis**

**No. of credits: 3**

**No. of instructional hours per week: 4**

**Aims of the Course / Objectives**

The aim of the course is to guide the students to the world of Hindi Fiction (Novel & Short Story). To develop enthusiasm in Literary and aesthetic approaches. To understand various aspects and dimensions of literature.

**Module 1**

Short story (Prescribe a short story collection)

**Module 2**

Novel (Prescribe a novel of post eighties)

**Module 3**

**Literary Analysis**

The meaning and definitions of literature – Types of literature – Literature and film – Literature and Mass Communication Media – Print media – Electronic media etc.

**Literary criticism**

Models of Literary Criticism – Short story – Poetry – Novel – Drama – Film etc.

**Prescribed Textbooks**

- |   |   |
|---|---|
| 1. Short story collection<br>(Non-Detailed) | Kahani Sankalan<br>Edited by Dr. Sushama Dubey &<br>Dr. Rajkumar<br>Published by Vani Prakashan<br>21 – A, Dariagang, New Delhi-2 |
|---|---|

**Stories to be studied**

- |                            |  |
|----------------------------|--|
| 1. Gunda                   | - Jayasankar Prasad  |
| 2. Kafan                   | - Premchand  |
| 3. Raja Nirbansiya         | - Kamaleswar   |
| 4. Sikka Badal Gaya        | - Krishna Sobti  |
| 2. Novel<br>(Non Detailed) | - ABCD<br>by Ravindra Kaliya<br>Published by Vani Prakasan<br>New Delhi-2                                    |
| 3. Literary Analysis       | - Sahithya Vivechan<br>by Jayanthi Prasad Nautiyal<br>published by Kitab Ghar Prakasan<br>Dariya Ganj, Delhi |

(Chapters 3, 4, 5, 6 and 9 should be omitted)

**Language Course V (Additional Language II)**  
**15UFR211.1: Translation and communication in**  
**French**

**No. of credits: 3**

**No. of instructional hours per week: 4**

**AIMS:**

The aim of the course is to facilitate the use of translation for more communication.

**OBJECTIVES:**

1. To ameliorate the level of language proficiency
2. To analyse the translated texts.
3. To enhance the ability to translate to the target language.

**SYLLABUS:**

NAME OF TEXT: **CONNEXIONS** – Niveau 1 By Régine Mérieux and Yves Loiseau

Publisher : Didier

Module 2 : Echanger

Unit 4 : Enquête

Unit 5: Invitations

Unit 6: A table !

Reference books:

1. Le Nouveau Sans Frontières Vol I by Philippe Dominique
2. Panorama Vol I by Jacky Girardet
3. Cours de langue et de civilisation française Vol I (Mauger Bleu)

**Core Course II**

**15UMM221: Foundations of Mathematics**

**No. of credits: 3**

**No. of instructional hours per week: 4**

**Module 1 - Theory of Numbers**

Text :S. Bernard and J. M. Child, Higher Algebra, Enlarged Editions, AITBS Publishers, India 2012

Division Algorithm, results on GCD, prime and composite numbers, co-prime numbers, unique-factorisation theorem, infinitude of primes, number and sum



of divisors of a given number, the symbol  $| [X/Y]$ , the result that the product of  $n$  consecutive numbers is divisible by  $n!$ , method of induction, examples, congruences, some basic properties, Euler's phi-function,

$\phi(mn) = \phi(m)\phi(n)$  if  $(m,n) = 1$ , product formula for  $\phi(n)$ , Fermat's theorem.

It is based on Chapters I and XXVI of the text.

### **Module 2 - Calculus**

Text : Howard Anton, et al, Calculus, Seventh Edition, John Wiley

The concept of the derivative of a function, maxima and minima problems, the idea of integration as anti-differentiation, finding position and velocity by integration and uniformly accelerated motion, definition of area and net signed area, Riemann sums and the definite integral, the connection between anti-differentiation and Riemann-Integration, the fundamental theorem of calculus, applications of integration, irrational exponents, the exponential and logarithmic functions, differentiation and integration of exponential and logarithmic functions, inverse trigonometric functions, L'Hospital's rule, hyperbolic functions, various techniques of integration.

It is based on chapters 4 – 8 and chapter 11 of the text.

### **Module 3 - Analytical Geometry**

Text :S. L. Loney, The elements of Co-ordinate Geometry, Part I –Cartesian Coordinates, G. K. Publishers

Polar equation of a conic – equation to the directrices, equation to the asymptotes, polar equation of the tangent at a point, chord joining two points, polar equation of the polar at any point  $(r_1, \theta_1)$ , equation to the normal at a point, general equation of the second degree, equation to the asymptotes, tracing of conics.

It is based on Chapters 14 and 15 of the text.

#### **References:**

1. James Stewart, Essential Calculus, Thompson Publications, 2007.
2. Thomas and Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley.
3. S.Lang, A first Calculus, Springer.
4. S. L. Loney, Co-ordinate Geometry
5. H. S. Hall and S. R. Knight, Higher Algebra, Metric Edition, AITBS Publishers, 2002.
6. Tom M. Apostol, Introduction to Analytic Number Theory, Springer International Student Edition, 1998.

Distribution of instructional hours:

Module 1: 20 hours; Module 2: 32 hours; Module 3: 20 hours

**Complementary Course III**  
**15UST231.1: Analysis of Bivariate data and**  
**Introduction to Random Variables**

**No. of credits: 2**

**No. of instructional hours per week: 4**

This course will introduce the student the elementary ideas of Random variables, probability models and concepts including Mathematical expectation, correlation and regression.

**Module 1.** Analysis of bivariate data **(17 hours)**

1.1 Scatter diagram

1.2 Curve fitting-method of least squares, fitting of straight lines, parabola,

power curves  $y=ab^x$ ,  $y=ax^b$ ,  $y=ae^{bx}$ , and  $y=\frac{a}{x} + b$

**Module 2.** Correlation & Regression **(18 hours)**

2.1 Pearson's coefficient of correlation

2.2 Spearman's rank correlation

2.3 Straight line Regression and prediction.

**Module 3.** Random variables. **(20 hours)**

3.1 Discrete and continuous r.vs

3.2 Probability distribution of a random variable-Probability mass function(p.mf), probability density function(p.d.f) and distribution function(df)

3.3 Joint probability density function of two random variables, marginal and conditional distributions

3.4 Independence of random variables

3.5 Transformation of variables-one to one transformation of -discrete and continuous univariate random variables.

**Module 4.** Mathematical expectation . **(17hours)**

4.1 Mathematical expectation of random variables and its properties

4.2 Theorems on expectation of sums and product of independent random variables, conditional expectation

4.3 Moments, bivariate moments, Cauchy –Schwartz inequality and correlation coefficient

4.4 Moment generating function, characteristic function ,their properties and uses

**Module 5.** Numerical problem solving using scientific calculator and Computer (Excel) based on Modules 1, 2, 3 & 4.

Numerical problem solving using scientific calculator is included in the End Semester Examination( ESE) 15UST231.1 and Practical(numerical problems) using Computer(Excel) only for 15UST432.1 Practical Exam in semester IV.

#### References

1. Bhat B,R (1985):*Modern Probability Theory*, New Age International(p)Ltd
2. Gupta S. C and Kapoor V.K: *Fundamentals of Mathematical Statistics*, Sultan Chand and sons, New Delhi
3. Jim Pitman 1996:*Probability*, Narosa Publishing House, New Delhi
4. Parimal Mukhopadhyay(1996):*Mathematical Statistics*, New Central Book Agency(P)Ltd, Calcutta.

Rohatgi V.K(1993):*An introduction to probability theory and Mathematical Statistics*, Wiley Eastern, New Delhi.

### Complementary Course IV

#### 15UPY231.1: HEAT AND THERMODYNAMICS

**No. of credits: 2**

**No. of instructional hours per week: 2**

##### Unit I – Transmission of Heat (13 hours)

Thermal conductivity and thermometric conductivity-Lee's disc experiment-Weidmann and Franz law (statement only)-energy distribution in the spectrum of black body and results Wien's displacement law-Rayleigh-Jeans law-their failure and Planck's hypothesis-Planck's law-comparison-solar constant-its determination temperature of sun.

##### Unit II – Thermodynamics (13 hours)

Isothermal and adiabatic processes-work done-isothermal and adiabatic elasticity. Heat engines-Carnot's cycle-derivation of efficiency-petrol and diesel engine cycles efficiency in these two cases-second law of thermodynamics-Kelvin and Clausius statements.

##### Unit III – Entropy (10 hours)

Concept of entropy-change of entropy in reversible and irreversible cycles-principle of increase of entropy-entropy and disorder-entropy and available energy-T-S diagram for Carnot's cycle-second law in terms of entropy-calculation of entropy when ice is converted into steam.

#### References

1. Heat & Thermodynamics: N.Subramaniam & Brijlal, S.Chand & Co
2. Heat & Thermodynamics: W.Zemansky, McGraw Hill
3. Heat & Thermodynamics: C.L.Arora.

## SEMESTER III

### Language Course VI

#### 15UEN311.1: WRITING AND PRESENTATION SKILLS

**No. of credits: 4**

**No. of instructional hours per week: 5 (Total 90 hrs.)**

#### AIMS

1. To familiarize students with different modes of general and academic writing.
2. To help them master writing techniques to meet academic and professional needs.
3. To introduce them to the basics of academic presentation
4. To sharpen their accuracy in writing.

#### OBJECTIVES

On completion of the course, the students should be able to

1. understand the mechanism of general and academic writing.
2. recognize the different modes of writing.
3. improve their reference skills, take notes, refer and document data and materials.
4. prepare and present seminar papers and project reports effectively.

#### COURSE OUTLINE

##### Module 1

Writing as a skill – its importance – mechanism of writing – words and sentences - paragraph as a unit of structuring a whole text – combining different sources – functional use of writing – personal, academic and business writing – creative use of writing.

##### Module 2

Writing process - planning a text – finding materials - drafting – revising – editing - finalizing the draft .

##### Module 3

Writing models – essay - expansion of ideas/proverbs – dialogue - letter writing – personal letters formal letters - CV – surveys – questionnaire - e-mail – job application - report writing. Academic writing - writing examinations - evaluating a text - note-making- paraphrasing – summary writing - planning a text – organizing paragraphs – introduction – body – conclusion – rereading and rewriting - accuracy.

**Module 4**

Presentation as a skill - elements of presentation strategies – audience – objectives – medium – key ideas - structuring the material - organizing content - audio-visual aids – handouts - use of power point - clarity of presentation - non-verbal communication - seminar paper presentation and discussion.

**COURSE MATERIAL**

Modules 1 – 4 Core reading: Write Rightly. Cambridge University Press, India Pvt Ltd, 2012

Further reading:

1. Robert, Barraas. Students Must Write. London: Routledge, 2006.
2. Bailey, Stephen. Academic Writing. Routledge, 2006.
3. Hamp-Lyons, Liz, Ben Heasley. Study Writing. 2nd Edition. Cambridge Uty Press, 2008.
4. Ilona, Leki. Academic Writing. CUP, 1998.
5. McCarter, Sam, Norman Whitby. Writing Skills. Macmillan India, 2009.
6. Jay. Effective Presentation. New Delhi: Pearson, 2009.

**Reference:** Mayor, Michael, et al, Ed. Longman Dictionary of Contemporary English. 5th Edition. London: Pearson Longman Ltd, 2009.

**Language Course VII (Additional Language III)**

**15UML311.1: ദൃശ്യകലാസാഹിത്യം**

**No. of credits: 4**

**No. of instructional hours per week: 5**

**പഠനോദ്ദേശ്യം :**

ദൃശ്യകലാ സംസ്കാരത്തിന്റെ സമ്പന്നതയെക്കുറിച്ചുള്ള അറിവ് വിദ്യാർത്ഥികൾ നേടേണ്ടതുണ്ട്. കഥകളി, തുള്ളൽ, നാടകം, സിനിമ എന്നീ ദൃശ്യകലകളെയും അവയ്ക്ക് ആധാരമായ സാഹിത്യപാഠങ്ങളെയും വിദ്യാർത്ഥികൾക്ക് പരിചയപ്പെടുത്തുകയാണ് ലക്ഷ്യം.

**മൊഡ്യൂൾ ഒന്ന് (36 മണിക്കൂർ)**

**ആട്ടക്കഥ, തുള്ളൽ സാഹിത്യം**

കഥകളിയുടെ ഉത്ഭവവികാസ പരിണാമങ്ങൾ, പ്രധാന ആട്ടക്കഥാകൃത്തുക്കൾ തുള്ളൽ പ്രസ്ഥാനം - സാമാന്യ പരിചയം

- 1. ഉണ്ണായിവാര്യാർ - നളചരിതം ആട്ടക്കഥ (നാലാംദിവസം)  
(രണ്ടാം സ്വയം വരത്തിനെത്തിയ നളനെ  
ദമയന്തി കാണുന്ന ഭാഗം വരെ)
- 2. കുഞ്ചൻ നമ്പ്യാർ - കല്യാണസൗഗന്ധികം തുള്ളൽ  
(ഹനുമാൻ-ഭീമ സംവാദം)

**മൊഡ്യൂൾ രണ്ട് (36 മണിക്കൂർ)**

**നാടക സാഹിത്യം**

- മലയാള നാടക പ്രസ്ഥാനം - സാമാന്യവലോകനം
- 1. മലയാള ശാകുന്തളം - എ.ആർ.രാജരാജവർമ്മ  
(നാലാം അങ്കം)
- 2. തോപ്പിൽ ഭാസി - അളിയൻ വന്നത് നന്നായി

**മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)**

**തിരക്കഥാപഠനം**

ചലച്ചിത്രനിർമ്മിതിയിൽ തിരക്കഥയ്ക്കുള്ള പ്രാധാന്യത്തെക്കുറിച്ച് സാമാന്യജ്ഞാനം.  
എം.ടി. വാസുദേവൻ നായർ - ഒരു വടക്കൻ വീരഗാഥ

**റഫറൻസ് ഗ്രന്ഥങ്ങൾ**

- 1. കേരള സാഹിത്യ ചരിത്രം - ഉള്ളൂർ
- 2. സാഹിത്യ ചരിത്രം പ്രസ്ഥാനങ്ങളിലൂടെ - ഡോ.കെ.എം.ജോർജ്ജ്
- 3. കൈരളിയുടെ കഥ - എൻ.കൃഷ്ണപിള്ള
- 4. കുഞ്ചൻ നമ്പ്യാർ വാക്കും സമൂഹവും- കെ.എൻ.ഗണേഷ്
- 5. നാട്യശാസ്ത്രം - ഭരതമുനി
- 6. കഥകളി - ജി.കൃഷ്ണപിള്ള
- 7. കഥകളിരംഗം - കെ.പി.എസ്. മേനോൻ
- 8. കഥകളിയും സാഹിത്യവും - മാടശ്ശേരി
- 9. കഥകളി വിജ്ഞാന കോശം - അയ്യപ്പൻ കൃഷ്ണമേനോൻ
- 10. നളചരിതം വ്യാഖ്യാനം - എം.എച്ച്. ശാസ്ത്രികൾ
- 11. കഥകളി മഞ്ജരി - ഡോ.എസ്.കെ നായർ
- 12. ആത്മകഥ - പി.കൃഷ്ണൻ നായർ
- 13. ദി ആർട്ട് & ലിറ്ററേച്ചർ ഓഫ് കഥകളി- ഡോ.എസ്.കെ. നായർ
- 14. സിനിമയുടെ ലോകം - അരുൺ ഗോപലകൃഷ്ണൻ
- 15. ആധുനിക മലയാള സിനിമ - കെ.പി. രാമൻ കുട്ടി
- 16. സിനിമയുടെ വഴിയിൽ - ഐ.ഷൺമുഖദാസ്
- 17. സഞ്ചാരിയുടെ വീട് - ഐ.ഷൺമുഖദാസ്
- 18. കഥയും തിരക്കഥയും - എ.ജി. രാജ്കുമാർ
- 19. സിനിമയും മലയാളസാഹിത്യവും - മധു ഇറവങ്കര

20. മലയാള സിനിമ	-	സിനിക്
21. ചലച്ചിത്രത്തിന്റെ പൊരുൾ	-	വിജയകൃഷ്ണൻ
22. ചലച്ചിത്ര സമീക്ഷ	-	വിജയകൃഷ്ണൻ
23. സിനിമയുടെ രാഷ്ട്രീയം	-	രവീന്ദ്രൻ
24. കാഴ്ചയുടെ അശാന്തി	-	രവീന്ദ്രൻ
25. സിനിമയെ കണ്ടെത്തൽ	-	എം.എഫ്.തോമസ്
26. മലയാള സിനിമ അരങ്ങുറ്റാണ്ട്	-	(എഡി) കെ.ജയകുമാർ
27. എം.ടി, കല, കാലം, വ്യക്തി	-	(എഡി) കെ.ജയകുമാർ
28. എം.ടി. കഥയും പൊരുളും	-	(എഡി) എം.എം. ബഷീർ
29. എം.ടി.യുടെ സർഗ്ഗപ്രപഞ്ചം	-	കേരളഭാഷാഇൻസ്റ്റിറ്റ്യൂട്ട്
30. നാടകദർപ്പണം	-	എൻ.എൻ. പിള്ള
31. നാടകം ഒരു പഠനം	-	സി.ജെ.തോമസ്
32. ഉയരുന്ന യവനിക	-	സി.ജെ.തോമസ്
33. നാടക പഠനങ്ങൾ	-	എഡിറ്റർ പന്മന രാമചന്ദ്രൻ നായർ
34. എം.ടി.കല,കാലം,സ്വത്വം	-	ഡോ.എ.എസ്. പ്രതീഷ്

**Language Course VII (Additional Language III)**  
**15UHN311.1: Drama, One Act Plays and Technical Terminology**

**No. of credits: 4**

**No. of instructional hours per week: 5**

**Aim of the Course / Objectives**

The aim of the course is to appreciate the literary and stylistic elements of Hindi Drama and One Act plays. To understand the distinct features of Hindi Drama. To understand Hindi as the National and official language of India. To overcome multilingual problems and its implications. To familiarize the technical terms used in offices.

**Module 1**

Drama – Prescribe a Drama (Post Sixties)

**Module 2**

One Act plays (Prescribe a collection of one act play)

**Module 3**

Technical Terminology (Prescribe a text book)

Translation of Technical terms – official terms (English to Hindi and Hindi to English)

**Prescribed Textbooks**

1. Drama (Detailed) - Ek aur Dronacharya  
By Shankar Shesh  
Published by Parameswari Prakashan,  
Preeth Vihar, Delhi
2. One Act Plays (Detailed) - Panch Rang  
Edited by Dr. Jagathpal Sharma  
Published by Navodaya Sales, New Delhi

**Lessons to be studied**

1. Lekshmi ka Swagath - Upendranath Ashk
2. Reed ki Haddi - Jagadeesh Chandra Mathur
3. Bahut Bada Saval - Mohan Rakesh
3. Technical Terminology - 'Paribhashik Sabdavali'  
Edited by Dr. Satheesh kumar G.  
Chairman (BOS)

**Language Course VII (Additional Language III)****15UFR311.1: Literature in French****No. of credits: 4****No. of instructional hours per week: 5****AIMS:**

The aim of the course is to acquaint students with French literature with consistent emphasis on grammar and vocabulary.

**OBJECTIVES:**

1. To enhance literary sensibility
2. To introduce students to the world of French literature.

**SYLLABUS:**NAME OF TEXT: **CONNEXIONS** – Niveau 1 By Régine Mérieux and Yves Loiseau

Publisher : Didier

Module 3 : Agir dans l'espace

Unit 7 : Rallye

Unit 8 : chez moi

Unit 9 : Les vacances

The following poems to be studied:

1. Le Pont Mirabeau - Guillaume Apollinaire
2. Déjeuner du Matin - Jacques Prévert



3. Le Pélican - Robert Desnos
4. Noel - Théophile Gautier
5. Chanson d'Automne - Paul Verlaine
6. Pour faire le portrait d'un oiseau – Jacques Prévert

Reference books :

1. Le Nouveau Sans Frontières Vol I by Philippe Dominique
2. Panorama Vol I by Jacky Girardet
3. Cours de langue et de civilisation française Vol I (Mauger Bleu)
4. A bouquet of French poems (Polyglot house) by Prof. T.P Thamby

### Core Course III

### 15UMM341: Calculus and Analytic Geometry

**No. of credits: 4**

**No. of instructional hours per week: 5**

#### **Module 1 - Calculus - I**

Text :S. Narayan and Manicavachagom Pillai, Calculus, Volume I

Revision methods of integration, applications of integration, rectification, quadrature, surface area and volume of solid of revolution, evolutes, asymptotes.

#### **Module 2 - Calculus - II**

Text :Howard Anton, et al, Calculus, Seventh Edition, John Wiley

The operations of differentiation and integration to vector valued functions of a real variable, based on chapter 13 of the text. All sections of this chapter must be discussed, with emphasis on geometry and physics, the problems given in various exercises should be an essential part of the course. Exercise 17(a) and 17(b) of exercise set 13.5 on curvature of plane curves and some of its applications in the subsequent exercises must be discussed in detail.

#### **Module 3 - Analytic Geometry**

Text :T. K. Manicavachagom Pillai and T. Natarajan, A text book of analytic geometry

Direction cosines, direction ratios, section formula, angle between two lines, projections, the plane – various equations, angle between two planes, plane passing through line of intersection of two planes, length of the perpendicular, the straight line – symmetrical form of equations to a straight line, straight line passing through two given points, the plane and the straight line, coplanar lines, skew lines, shortest distance between two skew lines.

References:

1. James Stewart, Essential Calculus, Thompson Publications, 2007
2. Thomson and Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley

3. S. Lang, A first Calculus, Springer
4. P. K. Jain and Khalil Ahmad, A Text Book of Analytical Geometry, Wiley Eastern Limited
5. Shanti Narayan, Analytical Solid Geometry, S. Chand & Company Pvt Ltd.

Distribution of instructional hours:

Module 1: 27 hours; Module 2: 27 hours; Module 3: 36 hours

### **complementary Course V**

#### **15UST331.1: Distribution Theory and Limit Theorems**

**No. of credits: 3**

**No. of instructional hours per week: 5**

This course introduces basic (standard) probability models, limit theorems, sampling distributions, the logic of statistical inference and related methods of statistical estimation. The students should be able to use statistical tables and judge the quality of estimators.

**Module 1.** Standard distributions (25 hours)

- 1.1 Discrete distributions -Degenerate (univariate), Uniform, Bernoulli, Geometric, binomial, Poisson and hypergeometric distributions
- 1.2 Continuous distributions- Rectangular, exponential, Gamma, beta and Normal distributions

**Module 2.** Law of large numbers (20 hours)

- 2.1 Chebychev's inequality, convergence in probability
- 2.2 Law of large numbers- Weak law of large numbers(WLLN), Bernoulli's law of large numbers
- 2.3 Central Limit Theorem(Lindberg-Levy form-statement only)

**Module 3** Sampling distributions: (20 hours)

- 3.1 Definitions of statistic, parameter, sampling distribution and standard error.
- 3.2 Sampling distributions of mean(derivation required) and variance of Normal distribution
- 3.3 Chi-square, t and F- distributions (derivations not required), distribution of sum of square of n independent standard normal variates.
- 3.4 Examples of statistics following t and F distributions and relation between normal, t, chi-square and F distributions

**Module 4.** Theory of estimation (25 hours)

- 4.1 Concept of point estimation, desirable properties of estimation- unbiasedness, sufficiency, efficiency, consistency

- 4.2 Methods of estimation of mean & variance -methods of moments ,MLE, method of minimum variance ( MVUE) and attainment of Cramer-Rao lower bound.
- 4.3 Concept of interval estimation, interval estimate of mean,variance and proportion..

**Module 5:** Numerical problem solving using scientific calculator and Computer (Excel) based on Modules I,II,III&IV. Numerical problem solving using scientific calculator is included in the End Semester Examination( ESE) ST 1331.1 and Practical(numerical problems) using Computer(Excel) only for ST 1432.1 Practical Exam in semester IV.

#### References

1. Methi J (2005):*Statistical Methods- an introductory text*, New Age International.(P)Ltd,New Delhi
2. Gupta S. C and Kapoor V.K (1980): *Fundamentals of Mathematical Statistics*, Sultan Chand and sons, New Delhi
3. John E Freud(2003):*Mathematical Statistics*,Prentice Hall of India
4. Parimal Mukkppadhya: *Mathematical Statistics*,New Central Book Agency(p)Ltd,Calcutta
5. Rohatgi V.K(1993): *An introduction to probability theory and Mathematical Statistics*, Wiley Eastern,New Delhi

### Complementary Course VI

#### 15UPY331.1: OPTICS, MAGNETISM AND ELECTRICITY

**No. of credits: 3**

**No. of instructional hours per week: 3**

**Unit I (34 hours)**

**Interference (12 hours)**

Analytical treatment of interference-theory of interference fringes and bandwidth. Interference in thin films-reflected system-colour of thin films-fringes of equal inclination and equal thickness. Newton's rings-reflected system-measurement of wavelength and refractive index of liquid.

**Diffraction (14 hours)**

Phenomenon of diffraction-classification-Fresnel and Fraunhofer. Fresnel's theory of approximate rectilinear propagation of light-Fresnel diffraction at a

straight edge and circular aperture. Fraunhofer diffraction at a single slit, two slits and N slits. Plane transmission grating-determination of wavelength-Resolving power of grating.

**Laser and Fibre Optics (8 hours)**

Principle of operation of laser-population inversion-optical pumping-ruby laser applications of lasers. Light propagation in optical fibres-step index fibre-graded index fibre-applications.

**Unit II (20 hours)**

**Magnetism (10 hours)**

Magnetic properties of matter-definition and relation between magnetic vectors B, H and M. Magnetic susceptibility and permeability. Magnetic properties-diamagnetism - paramagnetism – ferromagnetism – antiferromagnetism - Electron theory of magnetism explanation of ferromagnetism.

**Electricity (10 hours)**

EMF induced in a coil rotating in a magnetic field-peak, mean, *rms* and effective values of A.C. AC circuits-AC through RC, LC, LR and LCR series circuits resonance-sharpness of resonance-power factor and choke coil-transformers.

**References**

1. A text book of optics – Brijlal & Subramaniam
2. Electricity and Magnetism – R.Murugesan, S.Chand & Co Ltd.
3. A text book of B.Sc subsidiary Physics – P.Vivekanandan.

**SEMESTER IV**  
**Language Course VIII**  
**15UEN411.1: READINGS IN LITERATURE**

**No. of credits: 4**

**No. of instructional hours per week: 5 (Total 90 hrs.)**

**AIMS**

1. To sensitize students to the aesthetic, cultural and social aspects of literature.
2. To help them analyze and appreciate literary texts.

**OBJECTIVES**

On completion of the course, the students should be able to:

1. Understand and appreciate literary discourse.
2. Look at the best pieces of literary writing critically.
3. Analyze literature as a cultural and interactive phenomenon.

**Module 1**

What is literature – literature and context – genres – literature and human values – creative use of language – inculcation of aesthetic sense.  
Poetry – what is poetry – different types of poetry – poetic diction – figurative language – themes – stanza – rhyme.

**Module 2**

**Drama.** Scope and definition – different types – one act plays - structure – dialogue – characters – action.

**Module 3**

**Prose** What is prose – different types – personal – impersonal – technical.

**Module 4: Fiction.**

What is fiction – different types – plot – characters – setting – point of view – short story – its characteristics.

**COURSE MATERIAL**

**Module 1**

Core reading: Readings in Literature. Department of Publications, University of Kerala. Poems prescribed:

1. William Shakespeare: To Be or Not to Be (Hamlet, Act III, Scene 1)
2. William Blake: The Tiger
3. William Wordsworth: Lucy Gray
4. Alfred Lord Tennyson: Tithonus
5. Milton: On His Blindness
6. Rabindranath Tagore: Leave This Chanting (Poem 11 from Gitanjali)

7. John Keats: Ode to Autumn
8. Ted Hughes: Full Moon and Little Frieda.

### **Module 2**

Core reading: Vincent Godefroy - Fail not our Feast [from Dramatic Moments: A Book of One Act Plays. Orient Black Swan, 2013]

### **Module 3**

Core reading: Readings in Literature. Department of Publications, University of Kerala.

Essays prescribed:

1. Robert Lynd: The Pleasures of Ignorance
2. Martin Luther King: I Have a Dream
3. Stephen Leacock: The Man in Asbestos
4. Isaac Asimov: The Machine That Won the War.
5. E.R. Braithwaite: To Sir, with Love [extract]

### **Module 4**

Core reading: Stories for Life, Indian Open University.

Stories prescribed:

- (i) Catherine Mansfield: A Cup of Tea.
- (ii) O Henry: The Last Leaf.
- (iii) Rabindranth Tagore: The Postmaster.
- (iv) Oscar Wilde: The Happy Prince.
- (v) Ernest Hemingway: A Day's Wait
- (vi) Further reading
  1. A Concise Companion to Literary Forms. Emerald, 2013.
  2. Abrams, M. H. A Glossary of Literary Terms.
  3. Klarer, Mario. An Introduction to Literary Studies. Second edition. Routledge, 2009.

### **Direction to Teachers**

The introduction to various genres is intended for providing basic information and no conceptual analysis is intended.

**Language Course IX (Additional Language IV)**  
**15UML411.1: വിനിമയം, സർഗ്ഗാത്മക രചന,**  
**ഭാഷാവബോധം**

**No. of credits: 4**

**No. of instructional hours per week: 5**

**പഠനോദ്ദേശ്യം :**

(i) ആശയവിനിമയത്തിന്റെ വിവിധ ഘടകങ്ങളും പ്രക്രിയകളും വിദ്യാർത്ഥികൾക്ക് പരിചയപ്പെടുത്തുക. ആശയവിനിമയ സിദ്ധാന്തങ്ങളെക്കുറിച്ചും ആശയവിനിമയ മാതൃകകളെക്കുറിച്ചും അവബോധമുണ്ടാക്കുക.

(ii) ഭരണകാര്യങ്ങൾ മാതൃഭാഷയിലൂടെ നിർവഹിക്കപ്പെടണം എന്ന കാര്യം ഇന്ന് പൊതുവേ അംഗീകരിക്കപ്പെട്ടിട്ടുണ്ട്. മലയാളം ഭരണഭാഷയാകുമ്പോൾ ഉണ്ടാകുന്ന പ്രശ്നങ്ങളെക്കുറിച്ച് വിദ്യാർത്ഥികളെ ബോധവൽക്കരിക്കുക.

(iii) എഴുത്തുകാരുടെ രചനാനുഭവങ്ങൾ വിദ്യാർത്ഥികൾക്ക് പരിചയപ്പെടുത്തുക. സർഗ്ഗാത്മകരചനയ്ക്ക് വിദ്യാർത്ഥികളെ പ്രാപ്തരാക്കുക

(iv) പദം, വാക്യം, ചിഹ്നം എന്നിവ തെറ്റുകൂടാതെ പ്രയോഗിക്കുന്നതിലൂടെ ഭാഷാശുദ്ധി നിലനിർത്തുക. വിവർത്തനത്തിൽ പ്രായോഗിക പരിശീലനം നൽകുക.

**പാഠ്യപദ്ധതി**

**മൊഡ്യൂൾ ഒന്ന് (18 മണിക്കൂർ)**

**വിനിമയവും മാധ്യമങ്ങളും**

വിനിമയം-നിർവ്വചനം - ആശയവിനിമയ പ്രക്രിയ - വ്യവസ്ഥാപനം, നിർവ്വ്യവസ്ഥാപനം, ആശയവിനിമയ പ്രക്രിയയുടെ ഘടകങ്ങൾ, ആശയവിനിമയ മാതൃകകൾ - വിവിധതരം ആശയവിനിമയങ്ങൾ - വിവിധതരം മാധ്യമങ്ങൾ - അച്ചടി, റേഡിയോ, ടെലിവിഷൻ, സിനിമ, ഇന്റർനെറ്റ് തുടങ്ങിയ നവമാധ്യമങ്ങൾ - ഇവയുടെ സവിശേഷതകൾ - മാധ്യമങ്ങളും സമൂഹവും

**വിശദപഠനത്തിന്**

മാദ്ധ്യമം : മൗലികതയും നിരാകരണവും - ഡോ.എ.ശ്രീധരൻ, നാഷണൽ ബുക്ക് സ്റ്റാൾ (താഴെപ്പറയുന്ന രണ്ടു ലേഖനങ്ങൾ മാത്രം)

- 1. മാനവ ആശയവിനിമയം - തത്ത്വവും പ്രയോഗവും
- 2. ആശയ വിനിമയം - സിദ്ധാന്തവും പ്രയോഗവും

**മൊഡ്യൂൾ രണ്ട് (18 മണിക്കൂർ)**

**ഭരണഭാഷ മലയാളം**

ഭരണഭാഷ - നിർവ്വചനം - ഭരണനിർവ്വഹണം മാതൃഭാഷയിലൂടെ ആകേണ്ടതിന്റെ ആവശ്യകത - മലയാളം ഭരണഭാഷയാകുമ്പോൾ സ്വീകരിക്കേണ്ട മുന്നൊരുക്കങ്ങൾ ഭരണഭാഷയ്ക്കുണ്ടായിരിക്കേണ്ട ഗുണങ്ങൾ - നിയതാർഥ ബോധകം, ആർജ്ജവം, സുതാര്യത സരളം, ലഘുവാക്യങ്ങൾ, ആശയത്തെക്കുറിച്ചുള്ള അസന്ദിഗ്ദ്ധത മുതലായവ - വിവിധ സർക്കാർ വകുപ്പുകളുടെ സാങ്കേതിക പദാവലികൾ.

**പഠനപ്രവർത്തനം**

ഇംഗ്ലീഷിലുള്ള സർക്കാർ ഉത്തരവുകളും നടപടിക്രമങ്ങളും മലയാളത്തിലേക്കു മാറ്റാനുള്ള പരിശീലനം.

**മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)**

**സർഗ്ഗാത്മകരചന**

സർഗ്ഗാത്മകത - നിർവ്വചനം - സർഗാത്മകതയുടെ ഉറവിടം - വിവിധ കാഴ്ചപ്പാടുകൾ - കാവ്യപ്രചോദനത്തെക്കുറിച്ചുള്ള ഭാരതീയ സങ്കല്പം - പ്രതിഭയെക്കുറിച്ചുള്ള രാജശേഖരന്റെ അഭിപ്രായം - ഭാവയിത്രി, കാരയിത്രി - ഭാവനയെപ്പറ്റി കോളറിഡ്ജ് - പ്രഥമഭാവനയും ദ്വിതീയ ഭാവനയും - ഫാന്റസിയും ഇമാജിനേഷനും തമ്മിലുള്ള വ്യത്യാസം - വേർഡ്സ് വർത്തിന്റെ കാവ്യനിർവ്വചനം - സർഗ്ഗാത്മകരചനയിലേക്കു നയിക്കുന്ന സാഹചര്യങ്ങൾ - ജന്മവാസനയും അനുഭവവും - രചനയുടെ വിവിധഘട്ടങ്ങൾ.

**പ്രായോഗിക പരിശീലനം**

കവിത, കഥ, ലഘുനാടകം ഹ്രസ്വചിത്രങ്ങൾക്കുള്ള തിരക്കഥ, ഫീച്ചർ തുടങ്ങിയവയുടെ രചനാപരിശീലനം വിദ്യാർത്ഥികൾക്ക് നൽകേണ്ടതാണ്. ആവശ്യമെങ്കിൽ വിദ്യാർത്ഥികളെ ഗ്രൂപ്പുകളായി തിരിക്കാവുന്നതാണ്.

**വിദേശപഠനത്തിന്**

- 1. സർഗ്ഗാത്മകത - ഡോ.കെ.എം. കോശി (സാഹിത്യവിജ്ഞാന പ്രവേശിക)
- 2. വാക്കുകളുടെ ശില്പം - എം.കെ. സാനു (കാവ്യതത്വപ്രവേശിക)
- 3. എന്റെ കവിതയെപ്പറ്റി - സുഗതകുമാരി (ഇരുൾചിറകുകളുടെ ആമുഖം)
- 4. കാഥികന്റെ പണിപ്പുര - എം.ടി.വാസുദേവൻ നായർ (ഒരുകഥ ജനിക്കുന്നു എന്ന അനുഭവക്കുറിപ്പ് മാത്രം)

**മൊഡ്യൂൾ നാല് (18 മണിക്കൂർ)**

**ഭാഷാവബോധം**

തെറ്റായ രൂപത്തിൽ എഴുതപ്പെടുന്ന വാക്കുകളും അവയുടെ ശരി



യായ രൂപങ്ങളും - വാക്യരചനയിൽ സാധാരണ വരുന്ന പിഴവുകളും അവ തിരുത്തുന്നതിനുള്ള മാർഗ്ഗനിർദ്ദേശങ്ങളും - പ്രധാനപ്പെട്ട ചിഹ്നങ്ങളും അവയുടെ പ്രയോഗ സാഹചര്യങ്ങളും.

**പ്രായോഗിക പരിശീലനം**

ഇംഗ്ലീഷിൽ നിന്ന് മലയാളത്തിലേക്കും മലയാളത്തിൽ നിന്ന് ഇംഗ്ലീഷിലേക്കുമുള്ള വിവർത്തനം - ഗദ്യം, പദ്യം, ശൈലികൾ, പഴഞ്ചൊല്ലുകൾ, സാങ്കേതിക പദങ്ങൾ മുതലായവയുടെ വിവർത്തനം.

**സഹായകഗ്രന്ഥങ്ങൾ**

1. മാധ്യമം : മൗലികതയും നിരാകരണവും - ഡോ.എം.എൻ. ശ്രീധരൻ, നാഷണൽ ബുക്ക് സ്റ്റാൾ
2. മാധ്യമങ്ങളും മലയാളസാഹിത്യവും - എം.വി.തോമസ്, കേരള സാംസ്കാരിക പ്രസിദ്ധീകരണ വകുപ്പ്
3. മാധ്യമങ്ങളും മലയാളസാഹിത്യവും - പലർ, കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
4. മാധ്യമവിചിന്തനം - ഡോ.കെ.വി.തോമസ്, ഡോ.മാത്യു ജെ.മുട്ടത്ത്, ലിപി പബ്ലിക്കേഷൻസ്
5. മലയാളവും ഇന്റർനെറ്റും - സുനീത ടി.വി, ലിപി പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
6. സൈബർ മലയാളം - (എഡി) സുനീത ടി.വി, കറന്റ് ബുക്സ്, തൃശൂർ
7. ഭാഷയും ഭരണഭാഷയും - ഡോ. എഴുത്തുർ രജതജവർമ്മ, ഇൻഫർമേഷൻ ആന്റ് പബ്ലിക്കേഷൻ വകുപ്പ്, കേരളസർക്കാർ
8. ഭരണ ശബ്ദാവലി - കേരളഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
9. വ്യത്താന്തപത്രപ്രവർത്തനം - സ്വദേശാഭിമാനി രാമകൃഷ്ണപിള്ള, മാജുബെൻ പബ്ലിക്കേഷൻസ്
10. ലിറിക്കൽ ബാലഡ്സിന്റെ ആമുഖം - വില്യം വേർഡ്സ്വർത്ത്, വിവേ ഡോ.തോന്നയ്ക്കൽ വാസുദേവൻ, എം.എൻ.വിജയൻ സാംസ്കാരിക വേദി
11. സാഹിത്യവിദ്യ - കുട്ടികൃഷ്ണമാരാർ, മാരാർ സാഹിത്യ പ്രകാശം, കോഴിക്കോട്.

- 12. കാഥികന്റെ പണിപ്പുര - എം.ടി.വാസുദേവൻ നായർ,  
ഡി.സി.ബുക്സ്
- 13. ഉയരുന്ന യവനിക - സി.ജെ.തോമസ്,  
മാജുബൻ പബ്ലിക്കേഷൻസ്,  
തിരുവനന്തപുരം
- 14. കാവ്യസ്വരൂപം - എസ്.ഗുപ്തൻനായർ,  
ലിപി പബ്ലിക്കേഷൻസ്,  
കോഴിക്കോട്
- 15. കഥയുടെ ന്യൂക്ലിയസ്സ് - ഡോ.വത്സലൻ വാതുശ്ശേരി,  
ഒലിവ് പബ്ലിക്കേഷൻസ്,  
കോഴിക്കോട്
- 16. ഇരുൾചിറകുകൾ - സുഗതകുമാരി
- 17. ഗദ്യശില്പം - സി.വി.വാസുദേവഭട്ടതിരി,  
കേരളഭാഷാഇൻസ്റ്റിറ്റ്യൂട്ട്
- 18. തെറ്റും ശരിയും - പ്രൊഫ.പന്മന രാമചന്ദ്രൻ നായർ,  
കറന്റ് ബുക്സ്, കോട്ടയം
- 19. തെറ്റില്ലാത്ത മലയാളം - പ്രൊഫ.പന്മന രാമചന്ദ്രൻ നായർ,  
കറന്റ് ബുക്സ്, കോട്ടയം
- 20. ഭാഷാശുദ്ധി സംശയപരിഹാരങ്ങൾ - പ്രൊഫ.പന്മനരാമചന്ദ്രൻ നായർ
- 21. ഭാഷാശുദ്ധിയും ഭരണഭാഷയും - ഡോ.വിളക്കുടിരാജേന്ദ്രൻ,  
പ്രിയദർശിനി പബ്ലിക്കേഷൻസ്
- 22. മലയാളഗൈലി - കുട്ടികൃഷ്ണമാരാർ, മാരാർ  
സാഹിത്യപ്രകാശം, കോഴിക്കോട്
- 23. തായ്മൊഴി - എം.എൻ.കാരശ്ശേരി
- 24. ഭരണഭാഷാപ്രശ്നങ്ങൾ - എം.വി.തോമസ്, കേരള  
ഭാഷാഇൻസ്റ്റിറ്റ്യൂട്ട്
- 25. വിവർത്തനവിചാരം - ഡോ.എൻ.ഇ.വിശ്വനാഥയ്യർ,  
കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
- 26. തർജ്ജമയുടെ താക്കോൽ - സി.വി. വാസുദേവഭട്ടതിരി, ലിപി  
പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
- 27. നല്ല മലയാളം - സി.വി.വാസുദേവഭട്ടതിരി, ലിപി  
പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
- 28. [http://en.wikipedia.org/wiki/media\\_influence](http://en.wikipedia.org/wiki/media_influence)
- 29. [http://en.wikipedia.org/wiki/creative\\_writing](http://en.wikipedia.org/wiki/creative_writing)
- 30. <http://www.du.ae.in/du/course creative-writing.pdf>.

**Language Course IX (Additional Language IV)**  
**15UHN411.1: Poetry, Translation and Communicative Hindi**

**No. of credits: 4**

**No. of instructional hours per week: 5**

**Aim of the Course / Objectives**

The aim of the course is to introduce the student to the world of Hindi Poetry Ancient and Modern. To sensitize the student to the aesthetic aspects of literary appreciation and analysis.

Systematic study of the theory, description and application of translation. To develop students **skill in communicative Hindi.**

**Module 1**

Poetry – Prescribe a poetry collection (Ancient and Modern)

**Module 2**

**Translation (Prescribe a text book)**

Translation definition – Importance of Translation – Field of Translation – Types of Translation – Literary, Non Literary Translation – Translation of English passage to Hindi.

**Module 3**

**Communicative Hindi (Prescribe a textbook)**

Procedure for the development of communicative skills of students. Use of Hindi language in different situations – in Home, in College, in Banks, in Hospitals, in Railway Stations in Book Shops etc. Names of Animals, Birds, Trees, Plants, diseases, vegetables, professions, kitchen utensils, etc.

**Prescribed Textbooks**

- |                                    |   |   |
|------------------------------------|---|---|
| 1. Poetry Collection<br>(Detailed) | - | Hindi Kavya Sopan<br>Edited by Sathyaprakash Misra<br>Published by Lokbharathi, New Delhi |
|------------------------------------|---|---|

**Poems to be studied**

- |  |  |
|--|--|
| 1. Kabeer – Sakhi – 1 to 8             |  |
| 2. Soordas – Pad – 1 to 3              |  |
| 3. Bihari – Doha – 1 to 4              |  |
| 4. Nadi ke Dweep – Agyey               |  |
| 5. Desh Gaan – Sarveswar Dayal Saksena |  |
| 6. Proud Shiksha – Dhoomil             |  |
| 2. Translation (Detailed)              | -  |
|  | Anuvad<br>Edited by Dr. M.S. Vinayachandran<br>Published by Lokbharathi Prakasan,<br>New Delhi |

(Chapter 2, 3 and 6 should be omitted. From chapter 4 Anuvad ke Prakar, Portions upto karyalayeen anuvad should be studied, Chapter -7 Translation. First 5 passages should be studied)

3. Communicative Hindi - Bolchaal ki Hindi  
By Dr. Suseela Gupt,  
Lokbharati Prakashan, Elahabad-1

(Conversations in Home, College, Bank, Hospital, Railway Station and Book shop should be studied. Names of Animals, Birds, Trees, Plants, Diseases, Professions, Vegetables, Kitchen utensils, Spices and Eatables should be studied.

### **Language Course IX (Additional Language IV)** **15UFR411.1: Culture and Civilization**

**No. of credits: 4**

**No. of instructional hours per week: 5**

**AIMS:**

This course is intended to familiarize the students with French culture and civilization with specific reference to Kerala culture.

**OBJECTIVES:**

1. To acquaint the students with French culture and civilization.
2. To comprehend, compare and understand better the civilization of one's native place.

**SYLLABUS:**

NAME OF TEXT: **CONNEXIONS** – Niveau 1 By Régine Mérieux and Yves Loiseau  
Publisher : Didier  
Module 4 : Se situer dans le temps  
Unit 10 : Au jour le jour  
Unit 11 : Roman  
Unit 12 : Je te retrouverai

**Articles on Kerala culture with special emphasis on festivals, tourist centres and cuisine.**

Reference books :

1. Le Nouveau Sans Frontières Vol I by Philippe Dominique
2. Panorama Vol I by Jacky Girardet
3. Cours de langue et de civilisation française Vol I (Mauger Bleu)

**Core Course IV**  
**15UMM441: Calculus and Trigonometry**

**No. of credits: 4**

**No. of instructional hours per week: 5**

**Module 1 - Higher Trigonometry**

Text :Venakt Raman and Manica Vachagam Pillai, T. M. Mac Robert

The exponential functions  $e^{i\theta}$ ,  $e^z$ , hyperbolic functions, separation into real and imaginary parts, summation of series.

**Module 2 - Calculus - I**

Text : Howard Anton, et al, Calculus, Seventh Edition, John Wiley

In this part of the course, we consider the **calculus of functions of two variables**. It is based on Chapter 14 and Chapter 15 of the text. The geometric interpretation of the ideas should be emphasized throughout, with the aid of plotting software such as Gnuplot. After a discussion of functions of two variable and their graphs, as in the first section of Chapter 14, we discuss the concepts of limit and continuity of such functions. We then move on to a discussion of differentiation of functions of two variables, as in Sections 14.1-14.3, 14.5 and 14.8-9. Section 14.4 on differentiability and differentials and Section 14.6 on directional derivatives and Section 14.7 on tangent planes need not be discussed. Integration in space is to be done as in Sections 1-5 of Chapter 15. The last three sections of Chapter 15 need not be discussed.

**Module 3 - Calculus -II**

Text :Calculus II, S. Narayan and Manicavachagom Pillai

**Beta and Gamma functions**. Some basic results and relation between the functions, **Fourier series**– Full range and Half range series, expansion into Fourier series and some deductions, Fourier series in interval  $(-l, l)$

**References:**

1. James Stewart, Essential Calculus, Thompson Publications, 2007.
2. Thomas and Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley.
3. S.Lang, A first Calculus, Springer.
4. ABC Series, Trigonometry.

Distribution of instructional hours:

Module 1: 24 hours; Module 2: 36 hours; Module 3: 30 hours

**Complementary Course VII**  
**15UST431.1: Testing of Hypotheses and Analysis of Variance**

**No. of credits: 3**

**No. of instructional hours per week: 5**

This course enables to understand statistical significance of testing of hypothesis, communicate conclusions and interpretations. Introduction of concepts of analysis of variance is also aimed at.

**Module 1.** Testing of hypothesis –Introduction **(25 hours)**

- 1.1 Concepts of statistical hypothesis- simple and composite, null and alternative, parametric and non-parametric hypotheses
- 1.2 Type I and Type II errors, critical regions, acceptance regions
- 1.3 one-tailed tests, two-tailed tests, level of significance, power of the test and p value, UMP test, Neyman-Pearson lemma (proof not required).

**Module 2.** Large sample tests & small sample tests **(25 hours)**

- 2.1 Large sample tests - One-sample tests- Testing significance of mean (when population variance is a) known and b) unknown), testing significance of proportion
- 2.2 Large sample tests - Two-sample tests- Testing significance of difference between two means (when population variances are a) known and b) unknown), Testing significance of difference between proportions.
- 2.3 Small sample tests - a) Normal test- Testing significance of mean(s) (when population variance(s) is/are known), b) Student's t test- Testing significance of mean(s) (when population variance(s) is/are unknown)  
c) Chi-square test- testing population standard deviation. d) F-test- Testing significance of standard deviations.
- 2.4  $\chi^2$  tests - Testing of goodness of fit, Testing independence of attributes, Testing homogeneity.
- 2.5 Paired t-test

**Module 3** Design of Experiments and Analysis of Variance (ANOVA) **(20 hours)**

- 3.1 Principles of design of experiments- randomization, replication and local control.
- 3.2 Model and analysis of variance- one way analysis (derivation required).
- 3.3 Model and analysis of variance- two way analysis (derivation not required).

**Module 4** Numerical problem solving using scientific calculator and Computer (Excel) based on Modules 1, 2 & 3.

Numerical problem solving using scientific calculator is included in the End Semester Examination( ESE), 15UST431.1 and Practical(numerical problems) using Computer(Excel) only for 15UST432.1 Practical Exam in semester IV.

#### References

1. Methi J (2005):*Statistical Methods- an introductory text*, New Age International.New Delhi
2. Paul G Hoel:Siney C Port,Charles J Stone(1971);*Introduction to Statistical Theory*, Universal Book Stall ,New Delhi.
3. John E Freud(2003):*Mathematical Statistics*,Prentice Hall of India
4. Das M.N, Giri N C (2003):*Design and Analysis of experiments*,New Age International(P)Ltd.

### Complementary Course VIII

#### 15UST432.1: Practical using Computer (Excel)

No. of credits: 4

The students will learn to use **statistical tools available in Excel and have onhand training in data analysis**. This course covers topics of courses I,II,III &IV.

Module 1: Use of Excel in Statistics (Charts, functions and data analysis),Practical covering Numerical problems based on Complementary Courses 15UST131.1 Descriptive Statistics and Introduction to Probability, 15UST231.1 Analysis of Bi-variate data and Introduction to Random Variables, 15UST331.1 Probability Distribution and Theory of Estimation & 15UST431.1 Testing of Hypotheses and Analysis of Variance.

**Charts**-Column, pie, and scatter

**Functions**-Evaluation of numerical problems using the following functions

**Data Analysis**- Use of the following tools in Data Analysis

**References**

1. Dan Remenyi, George Onofrei, Joe English(2010): An introduction to Statistics Using Microsoft Excel, Academic Publishing Ltd, UK
2. Neil J Salkind(2010): Excel Statistics, A Quick Guide, Sage Publication Inc. New Delhi
3. Vijai Gupta(2002): Statistical Analysis with Excel, VJ Books Inc, Canada

**Record of practical**

Presenting the certified record is mandatory to appear for the practical examination. Five questions are to be worked out in each sheet based on the topics in the syllabus as follows:

1. Diagrams and Graphs
2. Measures of Central Tendency and Dispersion
3. Moments, Skewness and Kurtosis
4. Probability
5. Univariate Random Variables
6. Bivariate Random Variables
7. Mathematical Expectation
8. Bivariate Moments
9. Fitting of Curves
10. Correlation and Regression
11. Standard Distribution-Discrete
12. Standard Distributions-Continuous
13. Law of Large Numbers
14. Sampling Distributions
15. Point Estimation
16. Interval Estimation
17. Large Sample Tests
18. Small Sample Tests
19. Analysis of Variance
20. Charts in Excel
21. Functions in Excel
22. Analysis tools in Excel

Print out of output of practical sheets 20, 21 and 22 are to be attached. CE and ESE marks are to be awarded and consolidated as per regulations of the FDP in affiliated Colleges, 2013.



## Complementary Course IX

### 15UPY431.1: MODERN PHYSICS AND ELECTRONICS

**No. of credits: 3**

**No. of instructional hours per week: 3**

#### Unit I

##### **Modern Physics (20 hours)**

Basic features of Bohr atom model-Bohr's correspondence principle-vector atom model-various quantum numbers-magnetic moment of orbital electrons-electron spin- Spin-Orbit coupling-Pauli's exclusion principle-periodic table-Atomic nucleus-basic properties of nucleus-charge, mass, spin, magnetic moment binding energy and packing fraction-nuclear forces-salient features-radioactivity radioactive decay-decay laws-decay constant-half life and mean life-radioactive equilibrium-secular and transient equilibrium-measurement of radioactivity-Nuclear detectors (basic ideas).

##### **Quantum mechanics (16 hours)**

Inadequacies of classical physics-experimental evidences-evidences for quantum theory- Planck's hypothesis-foundation of quantum mechanics-wave function and probability density-Schrödinger equation-time dependent and time independent particle in a potential box.

#### Unit II (18 hours)

##### **Electronics (10 hours)**

Current-voltage characteristics of a diode-forward and reverse bias-breakdown mechanism of p-n junction diode-Zener diode and its characteristics-half wave and full wave rectifiers - bridge rectifier-ripple factor, efficiency. Construction and operation of a bipolar junction transistor-transistor configurations current components-transistor characteristics-DC load line-Q point-AC load line transistor biasing-need for biasing-bias stabilization-biasing circuits-fixed bias, emitter feed back bias, voltage divider bias (qualitative study only). Transistor amplifier-basic features of an amplifier-gain, input and output resistances frequency response and band width-small signal CE amplifier-circuit and its operation

##### **Digital Electronics (8 hours)**

Number systems and codes-decimal numbers-binary arithmetic-1's and 2's complement decimal to binary conversion-octal numbers-hexadecimal numbers binary coded decimal digital codes-logic gates-NOT, OR, AND, NOR and NAND gates. Boolean algebra-Boolean operations-logic expressions-laws of Boolean algebra-De Morgan's theorem-Boolean expression for gate network-simplification of Boolean expression.

### References

1. Modern Physics – R.Murugesan, S.Chand & Co. Ltd.
2. A text book of B.Sc subsidiary Physics – P.Vivekanandan.
3. Principles of Electronics – V.K.Mehta.

## Complementary Course X 15UPY432: PRACTICALS

**No. of credits: 4**

**No. of instructional hours per week: 2**

1. Torsion Pendulum-  $n$  by torsional oscillations
2. Torsion Pendulum-  $n$  and  $I$  using equal masses
3. Fly Wheel
4. Cantilever-  $Y$  by pin and microscope method
5. Uniform bending-  $Y$  by pin and microscope
6. Symmetric bar pendulum-  $g$  and radius of gyration
7. Surface tension- capillary rise method
8. Coefficient of viscosity- capillary flow method
9. Specific heat-method of mixtures applying Barton's correction
10. Lee's disc- Thermal conductivity of cardboard
11. Melde's string- frequency of tuning fork
12. Method of parallax- optical constants of convex lens using i) mirror and mercury ii) mirror and water
13. Method of parallax- refractive index of liquid.
14. Spectrometer-  $A$ ,  $D$  and  $n$
15. Spectrometer- dispersive power of a prism
16. Spectrometer- Grating-normal incidence
17. Deflection and vibration magnetometer-  $M$  and  $Bh$
18. Circular coil- magnetization of a magnet
19. Carey Foster's bridge- Resistivity
20. Potentiometer- Resistivity
21. Potentiometer- Calibration of ammeter
22. Mirror galvanometer- Current and Voltage sensitivity
23. Diode Characteristics (for Ge and Si diodes)
24. Half wave rectifier-Measurement of ripple factor with and without filter capacitor
25. Full wave rectifier- Measurement of ripple factor with and without filter capacitor

**SEMESTER V**  
**Core Course V**  
**15UMM541: Real Analysis I**

**No. of credits: 4**

**No. of instructional hours per week: 5**

**Text :** R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, Third Edition, Wiley

In this course, we discuss the notion of real numbers and the ideas of limits in a formal manner. Many of the topics discussed in this course were introduced somewhat informally in earlier courses, but in this course, the emphasis is on mathematical rigor. It is based on Chapters 2-4 of the text.

In teaching this course, all ideas should be first motivated by **geometrical considerations and then deduced algebraically from the axioms of real numbers as a complete ordered field**. Also, the historical evolution of ideas, both in terms of physical necessity and mathematical unity should be discussed. Thus the course emphasizes the dialectic between practical utility and logical rigor in general, and within mathematics, that between geometric intuition and algebraic formalism.

Throughout the course, examples and exercises in the text should be used to illustrate the ideas discussed. Students should be encouraged to do problems on their own, to gain practice in writing rigorous proofs.

**Module 1**

The first step is to make precise the very concept of number and the rules for manipulating numbers. The course can start with a historical overview of how different kinds of numbers were constructed in different periods in history, depending on the physical or mathematical needs of the age. (See for example, the three articles on real numbers at [www-groups.dcs.st-and.ac.uk/~history/Indexes/Analysis.html](http://www-groups.dcs.st-and.ac.uk/~history/Indexes/Analysis.html)) A discussion on how real numbers are conceived as lengths and hence as points on a line should follow this. The efforts to approximate irrational numbers by rational numbers, in the familiar instances such as  $\sqrt{2}$  and  $\pi$  can lead to the modern decimal representation and this gives semi-rigorous definitions of operations on real numbers.

The **realization of the set  $\mathbb{R}$  of real numbers as a field** can be introduced at this stage and compared with the set  $\mathbb{Q}$  of rational numbers, as in 2.1.1-2.1.4 of the textbook. The idea of order in  $\mathbb{Q}$  and  $\mathbb{R}$  must be introduced next, as in 2.1.5-2.1.13 of the textbook. The notion of **absolute value and that of a neighbourhood**, as in 2.2.1-2.2.9 of the textbook comes next.

The discussion of the **COMPLETENESS PROPERTY** of  $\mathbb{R}$  requires some care. The version given in 2.3.6 of the text is highly counter-intuitive as an axiom. Instead, the following version due to Dedekind can be used:

*If the set of real numbers is split into two non-empty sets such that every number in one set is less than every number in the other, then either the first set contains a least number or the second set contains a largest number*

And this can be easily interpreted geometrically as a line considered as a set of points. (See R. Dedekind, *Essays on The Theory of Numbers*, available as a freely downloadable e-book at <http://www.gutenberg.org/etext/21016>) The SUPREMUM PROPERTY of  $\mathbb{R}$  can easily be proved as a consequence of this axiom.

It should be emphasized at this point that in this course, the only assumptions we make about  $\mathbb{R}$  are the axioms of a complete ordered field and every definition we make would be given in terms of these and every result we propose would be deduced from these axioms (and the theorems proved earlier). The remaining part of Section 2.3 and Section 2.4 in full are to be discussed as in the text. In Section 2.5, *the subsections*, THE UNCOUNTABILITY OF  $\mathbb{R}$ , BINARY REPRESENTATIONS, DECIMAL REPRESENTATIONS, PERIODIC DECIMALS and CANTOR'S SECOND PROOF need not be discussed.

### Module 2

We then pass on to the idea of **limits of sequences and series**, as in Chapter 3 of the text. It should be supplemented by Sections 10.2 and 10.4 of the calculus text by Anton (used in earlier semesters) to provide motivation, illustrative examples and more exercises.

### Module 3

**Limits of functions** are to be discussed as in Chapter 4 of the text. Before introducing the rigorous definition of limits, the informal description of these ideas through graphs, as done in the earlier calculus courses should be recalled. Also, the various theorems should be illustrated through examples and exercises given in the text. Plotting software such as Geogebra can be used to plot the various functions discussed in Chapter 4.

### References

1. A. D. Alexandrov et al., *Mathematics: Its Content, Methods and Meaning*, Dover
2. R. Dedekind, *Essays on The Theory of Numbers*, available as a freely downloadable e-book at <http://www.gutenberg.org/etext/21016>
3. W. Rudin, *Principles of Mathematical Analysis*, Second Edition, McGraw-Hill
4. A. E. Taylor, *General Theory of Functions and Integration*, Dover

Distribution of instructional hours:

Module 1: 30 hours; Module 2: 30 hours; Module 3: 30 hours

**Core Course VI**  
**15UMM542: Complex Analysis I**

**No. of credits: 3**

**No. of instructional hours per week: 4**

**Text :** Joseph Bak and Donald J. Newman, Complex Analysis. Third Edition, Springer

In this course, we discuss the basic properties of complex numbers and extend the notions of differentiation and integration to complex functions. It is based on Chapters 1-4 of the text. Examples and exercises in the text forms an integral part of the course.

**Module 1**

The basic operations on complex numbers are familiar to the students from their Highersecondary course. Also, the historical motivation for complex numbers is briefly touched upon in Module 1 of the fourth-semester course ALGEBRA AND CALCULUS IV. So, the present course can start with a brief review of the INTRODUCTION and a discussion on the representation of complex numbers as ordered pairs of real numbers as in Section 1.1. The other sections of this chapters are to be discussed in order. The definition of uniform convergence and 1.9 M-test in Section 1.4 need not be discussed. Also, STEREOGRAPHIC PROJECTION as in Section 1.5 need not be discussed, but infinite limits should be introduced (1.11 Definition). The use of complex numbers in number theory and geometry are to be illustrated using Exercises 9, 10 and 14 of this chapter.

We then pass on to the definition of **complex functions**, starting with polynomials as Chapter 2..The difference between a polynomial function of two real variables and that of *a single complex variable* should be emphasized as in the Introduction to this chapter. Also, in discussing ANOTHER WAY OF RECOGNIZING ANALYTIC POLYNOMIALS preceding 2.2 Definition, it should be noted that the field operations allow us only to define upto rational *functions* of complex numbers and that expressions like  $\cos(x + iy)$  are meaningless at this stage. In discussing POWER SERIES as in Section 2.8, *the proof of 2.8 THEOREM and the comment following the proof about uniform convergence need not be discussed*. Examples 1-3 following this are to be emphasized as signifying the behaviour of different power series on the circle of convergence. The remaining part of Chapter 2 should be discussed in full.

**Module 2**

In Chapter 3 on **ANALYTIC FUNCTIONS**, the proof of 3.2 Proposition on the sufficiency of Cauchy-Riemann Equations for analyticity need not be done. Except for this, Chapter 3 must be done in full. Exercises 21-23 on the power series expansions of the exponential function and the sine and cosine functions must also be discussed in detail.

### Module 3

In Chapter 4, the definition of the **integral of  $f$  along  $C$**  (4.3 DEFINITION of the text) should be motivated as limit of the Riemann sums of the form

$$\sum f(z_k)(z_k - z_{k-1})$$

(see for example, the MIT OPENCOURSEWARE

video of LECTURE 5 of PART I CALCULUS under CALCULUS REVISITED).

*In Section 4.1, the result on the integral of uniform limit (4.11 Proposition) need not be discussed.* Section 4.2 is to be discussed in full.

#### References

1. JAMES BROWN AND RUEL CHURCHILL, *Complex Variables and Applications*, Eighth Edition, McGraw-Hill
2. J. M. HOWIE, *Complex Analysis* Springer

Distribution of instructional hours:

Module 1: 24 hours; Module 2: 24 hours; Module 3: 24 hours

## Core Course VII

### 15UMM543: Differential Equations

**No. of credits: 3**

**No. of instructional hours per week: 3**

#### Texts :

1. Howard Anton, et al, *Calculus*, Seventh Edition, John Wiley
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Eighth Edition, Wiley-India

In this course, we discuss how **differential equations arise in various physical problems** and consider some methods to solve first order differential equations and second order linear equations. It is based on parts of Chapters 5 and 9 of [1] and Chapter 2 of [2].

#### Module 1

In this module we discuss first order equations and is based on [1]. We start with some simple **examples of physical situations in which differential equations arise**, using some of the examples of Section 9.3. This is to be followed by the last two subsections of Section 5.2, **INTEGRATION FROM THE VIEWPOINT OF DIFFERENTIAL EQUATIONS AND DIRECTION FIELDS** including problems related to these ideas from EXERCISE SET 5.2. We next consider first order differential equations as in Sections 9.1-9.3. Then we discuss **EXACT DIFFERENTIAL EQUATIONS** as in Section 1.5 of [2].

## Module 2

Second order linear differential equations are discussed in this module and it is based on Chapter 2 of [2]. More precisely, Sections 2.1-2.3 and Sections 2.4-2.11 must be done in detail, including relevant problems. Section 2.3 on DIFFERENTIAL OPERATORS *need not be discussed*

### References

1. G. F. SIMMONS, *Differential Equations with applications and Hystorical notes*, Tata McGraw-Hill, 2003
2. PETER V. O' NEIL, *Advanced Engineering Mathematics*, Thompson Publications, 2007

Distribution of instructional hours:

Module 1: 27 hours; Module 2: 27 hours

## Core Course VII 15UMM544: Vector Analysis

**No. of credits: 3**

**No. of instructional hours per week: 3**

**Text :** Howard Anton, et al, *Calculus*, 7<sup>th</sup>Edn, John Wiley

In this course, we consider some advanced parts of vector calculus. It is based on parts of Chapter 14 and Chapter 16 of the text. The physical motivation and interpretation of the various mathematical concepts should be emphasized throughout, as in the text.

### Module 1

We begin with the notion of directional derivatives as in Section 14.6. *The last subsection on derivative of a function of several variables need not be discussed.* We then pass on to the definition of a vector field and its divergence and curl, as in Section 16.1. The del and Laplacian operators must also be discussed. We next discuss line integrals, as in Section 16.2 and then conservative vector fields, as in Section 16.3. This module of the course ends with a discussion of Green's Theorem, as in Section 16.4.

### Module 2

In this module, we introduce the notion of a surface integral and discuss Gauss's Theorem and Stoke's Theorem and their applications, as in Sections 16.5-16.8 of the text

References:

1. Thomas and Finney, *Calculus and Analytic Geometry*, Ninth Edition, Addison-Wesley.
2. Kreyzig, *Advanced Engineering Mathematics*, 8<sup>th</sup> edition, John Wiley.
3. Peter V. O'Neil, *Advanced Engineering Mathematics*, Thompson Publications, 2007
4. Michael D. Greenberg, *Advanced Engineering Mathematics*, Pearson Education, 2002.

Distribution of instructional hours:

Module 1: 27 hours; Module 2: 27 hours

## Core Course VIII 15UMM545: Abstract Algebra I

**No. of credits: 4**

**No. of instructional hours per week: 5**

**Text :** John B. Fraleigh, *A First Course in Abstract Algebra*. Seventh Edition, Narosa

Students introduced to some elements of Abstract Algebra in Semester IV are now ready to do it rigorously. In this course, we discuss the basics of abstract group theory, based on Sections 2-10 of the text.

Students should be given training to write proofs and to do problems, based on axioms. The recommended text contains lots of examples and exercises. Most of the problems in this text are computational and hence the student can try them as assignments with proper guidance of the teacher.

### Module 1

The course begins with section 0, which can be reviewed quickly. *The subsection on CARDINALITY need not be discussed.* We then move on to Section 2 on binary relations (*skipping Section 1. The ideas of binary operation on a set, well definedness of a binary operation and a set closed under a binary operation should be emphasized.* Isomorphisms of binary structures should be done in detail, as in Section 3. After recalling the idea of abstract groups introduced in the previous semester, Section 4 on groups, Section 5 on subgroups and Section 6 on cyclic groups must be done in full. Section 7, GENERATING SETS AND CAYLEY DIGRAPHS, need not be discussed.

### Module 2

We next consider the group of permutations in detail, as in Section 8-10 (Chapter II) and cosets and Lagrange's Theorem, as in Section 10. The first part of Section 11 on direct products of groups should also be discussed. *The second part, FINITELY GENERATED ABELIAN GROUPS and the entire Section 12, PLANE ISOMETRIES need not be discussed.*



References:

1. I N Herstein, *Topics in Algebra*, Vikas Publications
2. J A Gallian, *Contemporary Abstract Algebra*, Narosa Publications
3. D A R Wallace, *Groups, Rings and Fields*, Springer

Distribution of instructional hours:

Module 1: 45 hours; Module 2: 45 hours

## Open Course

### 15UMM551.1: Operations Research (Open Course)

**No. of credits: 2**

**No. of instructional hours per week: 3**

**Module 1**

**LINEAR PROGRAMMING:** Formulation of Linear Programming models, Graphical solution of Linear Programs in two variables, Linear Programs in standard form - basic variable - basic solution- basic feasible solution -feasible solution, Solution of a Linear Programming problem using simplex method (Since Big-M method is not included in the syllabus, avoid questions in simplex method with constraints of  $\geq$  or  $=$  type.)

**Module 2**

**TRANSPORTATION PROBLEMS:** Linear programming formulation - Initial basic feasible solution (Vogel's approximation method/North-west corner rule) - degeneracy in basic feasible solution - Modified distribution method - optimality test.

**ASSIGNMENT PROBLEMS:** Standard assignment problems - Hungarian method for solving an assignment problem.

**Module 3**

**PROJECT MANAGEMENT:** Activity -dummy activity - event - project network, CPM (solution by network analysis only), PERT.

Text: Ravindran - Philps - Solberg: Operations Research- Principles and Practice

Reference:

Hamdy A Taha: *Operations Research*

Distribution of instructional hours:

Module 1: 18 hours; Module 2: 18 hours; Module 3: 18 hours

## Open Course

### 15UMM551.2: Business Mathematics (Open Course)

**No. of credits: 2**

**No. of instructional hours per week: 3**

#### Module 1

Basic Mathematics of Finance: Nominal rate of Interest and effective rate of interest, Continuous Compounding, force of interest, compound interest calculations at varying rate of interest, present value, interest and discount, Nominal rate of discount, effective rate of discount, force of discount, Depreciation.

(Chapter 8 of Unit I of text- Sections: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.9)

#### Module 2

Differentiation and their applications to Business and Economics: Meaning of derivatives, rules of differentiation, standard results (basics only for doing problems of chapter 5 of Unit 1) (Chapter 4 of unit I of text- Sections: 4.3, 4.4, 4.5, 4.6)

Maxima and Minima, concavity, convexity and points of inflection, elasticity of demand, Price elasticity of demand (Chapter 5 of Unit I of text - Sections: 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7)

Integration and their applications to Business and Economics: Meaning, rules of integration, standard results, Integration by parts, definite integration (basics only for doing problems of chapter 7 of Unit 1 of text) (Chapter 6 of unit I of text: Sections: 6.1, 6.2, 6.4, 6.10, 6.11)

Marginal cost, marginal revenue, Consumer's surplus, producer's surplus, consumer's surplus under pure competition, consumer's surplus under monopoly (Chapter 7 of unit I of text- Sections: 7.1, 7.2, 7.3, 7.4, 7.5)

#### Module 3

Index Numbers: Definition, types of index numbers, methods of construction of price index numbers, Laspeyer's price index number, Paasche's price index number, Fisher ideal index number, advantages of index numbers, limitations of index numbers

(Chapter 6 of Unit II of text- Sections: 6.1, 6.3, 6.4, 6.5, 6.6, 6.8, 6.16, 6.17)

Time series: Definition, Components of time series, Measurement of Trend (Chapter 7 of Unit II of text - Sections: 7.1, 7.2, 7.4)

Text: B M Aggarwal: Business Mathematics and Statistics Vikas Publishing House, New Delhi, 2009

#### References:

1. Qazi Zameeruddin, et al : *Business Mathematics* , Vikas Publishing House, New Delhi, 2009
2. Alpha C Chicny, Kevin Wainwright: *Fundamental methods of Mathematical Economics* ,Mc-Graw Hill, Singapre, 2005

Distribution of instructional hours:  
Module 1: 18 hours; Module 2: 18 hours; Module 3: 18 hours

**Open Course**  
**15UMM551.3: Actuarial Science (Open Course)**

**No. of credits: 2**

**No. of instructional hours per week: 3**

**Module 1**

Introduction to Insurance Business: What is Actuarial Science? Concept of Risk, Role of statistics in Insurance, Insurance business in India.

Introductory Statistics: Some important discrete distributions, Some important continuous distributions, Multivariate distributions

**Module 2**

Feasibility of Insurance business and risk models for short terms: Expected value principle, Notion of utility, risk models for short terms

Future Lifetime distribution and Life tables: Future life time random variable, Curate future-life time, life tables, Assumptions for fractional ages, select and ultimate life tables.

**Module 3**

Actuarial Present values of benefit in Life insurance products: Compound interest, Discount factor, Benefit payable at the moment of death, Benefit payable at the end of year of death, relation between  $A$  and  $\bar{A}$ .

Annuities, certain, continuous life annuities, Discrete life annuities, Life annuities with m<sup>thly</sup> payments.

Text: Shylaja R. Deshmukh :Actuarial Statistics University press, Hyderabad, 2009. Chapters 1-6.

**References:**

1. Bowers, Jr., N. L et al: *Actuarial Mathematics* , 2<sup>nd</sup>Edition, The society of Actuaries, Illinois, Schaumburg, 1997
2. Palande, P. S. et al: *Insurance in India: Changing policies and Emerging Opportunities*, Response Books, New Delhi, 2003
3. Purohit, S. G. et al: *Statistics Using R* , Narosa, New Delhi, 2008
4. www.actuariesindia.org

Distribution of instructional hours:  
Module 1: 12 hours; Module 2: 21 hours; Module 3: 21 hours

**SEMESTER VI**  
**Core Course IX**  
**15UMM641: Real Analysis II**

**No. of credits: 4**

**No. of instructional hours per week: 5**

**Text :** R. G. Bartle, D. R. Sherbert, *Introduction to Real Analysis*, Third Edition, Wiley

This course builds on the first course in Real Analysis done earlier and concentrates on real valued functions. We discuss the three properties of continuity, differentiability and Riemann integrability. The history of how calculus developed must also be discussed (see [en.wikipedia.org/wiki/History\\_of\\_calculus](http://en.wikipedia.org/wiki/History_of_calculus), for example).

**Module 1**

The intuitive geometric notion of **continuity** as an unbroken curve seen in the calculus course must be recalled and then the discussion should gradually lead to the  $\epsilon - \delta$  definition, as an effort to make this notion formal and rigorous. The connexion between continuity and existence of limit should be emphasized. The material contained in Sections 5.1-5.3 and Section 5.6 of the textbook forms the core of this part of the course. Section 5.4, UNIFORM CONTINUITY and Section 5.5, CONTINUITY AND GAUGES, *need not be discussed*.

**Module 2**

Differentiation and integration are extensively discussed in an earlier Calculus course, with a strong emphasis on computation. Here we take another look at **differentiation** from a conceptual point of view. It is based on Chapter 6 of the textbook. All the four sections of this chapter are to be discussed in detail.

**Module 3**

In this module, we discuss **Riemann's theory of integration**. It is based on Sections 7.1-7.3 of the text. Section 7.4, APPROXIMATE INTEGRATION *need not be discussed*.

Students have already seen integration as anti-differentiation and informally as the limit of sums in the calculus course. All these ideas are made more precise here. The historical evolution of the ideas leading to Riemann integral can be found in [en.wikipedia.org/wiki/Integral#History](http://en.wikipedia.org/wiki/Integral#History). The differences between anti-differentiation and Riemann's theory of integration should be stressed. Section 7.3 of the textbook must be seen as establishing the links between anti-differentiation and Riemann integration, Examples 7.3.2(e) and 7.3.7(a), (b) are significant in this context.

References

1. A. D. ALEXANDROV et al., *Mathematics: Its Content, Methods and Meaning*, Dover
2. R. DEDEKIND, *Essays on The Theory of Numbers*, available as a freely downloadable e-book at <http://www.gutenberg.org/etext/21016>)
3. W. RUDIN, *Principles of Mathematical Analysis*, Second Edition, McGraw-Hill
4. A. E. TAYLOR, *General Theory of Functions and Integration*, Dover

Distribution of instructional hours:

Module 1: 30 hours; Module 2: 30 hours; Module 3: 30 hours

## Core Course X 15UMM642: Linear Algebra

**No. of credits: 3**

**No. of instructional hours per week: 4**

**Text** :Thoma Banchoff and John Wermer, *Linear Algebra Through Geometry*, Second Edition, Springer

In this course we introduce the basics of linear algebra and matrix theory with emphasis on their geometrical aspects. It is based on the Chapters 1-4 of the text.

### Module 1

In this module we bring together some aspects of analytic geometry of two dimensions, solutions of simultaneous in two unknowns and theory of  $2 \times 2$  matrices under the unified theme of linear transformations of the plane. It is based on Chapters 1 and 2 of the text.

### Module 2

The ideas in the first module are extended to three dimensional space in this module. It is based on Chapter 3 of the text

### Module 3

The concepts discussed in the first two modules are generalized to arbitrary dimensions in this module. It is based on Chapter 4 of the text.

Text: References:

1. T S Blyth and E F Robertson: *Linear Algebra*, Springer, Second Ed.
2. R Bronson and G B Costa: *Linear Algebra*, Academic Press, Seond Ed.
3. David C Lay: *Linear Algebra*, Pearson
4. K Hoffman and R Kunze: *Linear Algebra*, PHI

Distribution of instructional hours:

Module 1: 24 hours; Module 2: 24 hours; Module 3: 24 hours

**Core Course XI**  
**15UMM643: Complex Analysis II**

**No. of credits: 3**

**No. of instructional hours per week: 3**

**Texts**

1. Joseph Bak and Donald J. Newman, *Complex Analysis*. Third Edition, Springer
2. James Brown and Ruel Churchill, *Complex Variables and Applications*, Eighth Edition, McGraw-Hill

In this course, we consider some of the basic properties of functions analytic in a disc or on a punctured disc. It is based on parts Chapters 6, 9, 10, 11 of [1] and Chapters 6 and 7 of [2].

**Module 1**

We start with Sections 6.1 and 6.2 of [1]. In Section 6.1, *only the statement of 6.5 POWER SERIES REPRESENTATION FOR FUNCTIONS ANALYTIC IN A DISC need be given; the proof need not be discussed*. But it should be linked to 2.10 COROLLARY to note that a function analytic in a disc is infinitely differentiable in it and with 2.11 COROLLARY to see how the coefficients of the series are related to the derivatives of the function. *Section 6.3 need not be discussed*.

We then pass on to a discussion of **isolated singular points and residues**, as in Chapter 6 (Sections 68-77). *Here and elsewhere, all examples and exercises involving logarithms must be skipped*.

**Module 2**

In this module, we consider the **application of the Residue Theorem in the evaluation of some integrals**, as in Chapter 7 of [2]. Only Sections 78-82 and Section 85 need be discussed. Sections 83-84 and Sections 86-89 need not be considered.

Section 11.2 of [1], APPLICATION OF CONTOUR INTEGRAL METHODS TO EVALUATION AND ESTIMATION OF SUMS, must also be discussed, along with the relevant exercises in this section.

**References:**

1. Ahlfors, L. V, *Complex Analysis*, McGraw-Hill, 1979.
2. J M Howie, *Complex Analysis*, Springer

**Distribution of instructional hours:**

Module 1: 27 hours; Module 2: 27 hours

**Core Course XII**  
**15UMM644: Abstract Algebra II**

**No. of credits: 3**

**No. of instructional hours per week: 3**

**Text:** John B. Fraleigh, *A First Course in Abstract Algebra*. Seventh Edn, Narosa

In this course, we discuss more of group theory and also the **basics of ring theory**. It is based on parts of Chapters II-V of the text. As in the first course, due emphasis must be given to **problem solving**.

**Module 1**

In this part of the course, we discuss **homomorphism of groups and factor groups**, as in Sections 13-15 of the text. *The last two parts of Section 15, SIMPLE GROUPS and THE CENTER AND COMMUTATOR SUBGROUPS need not be discussed..*

**Module 2**

We start by recalling the definition of rings, seen in an earlier course on algebra. Then Sections 18-20 must be discussed in detail. *Sections 21-25 need not be discussed*, But Section 26 on homomorphisms and factor rings must be done in full.

References:

1. I N Herstein, *Topics in Algebra*, Vikas Publications
2. J A Gallian, *Contemporary Abstract Algebra*, Narosa Publications
3. D A R Wallace, *Groups, Rings and Fields*, Springer

Distribution of instructional hours:

Module 1: 27 hours; Module 2: 27 hours

**Core Course XII**  
**15UMM645: Computer Programming**

**No. of credits: 4**

**No. of instructional hours per week: 5**

In this course, we teach **document preparation in computers using the LATEX typesetting program** and also the **basics of computer programming using Python**. Since the operating system to be used is gnu/Linux, fundamentals of this os are also to be discussed.

**Module 1**

Text : Matthias Kalle Dalheimer and Matt Welsh, *Running Linux*, Fifth Edition, O'Reilly

In this module, we consider the fundamentals of the gnu/Linux operating system. It is based on Chapter 4, BASIC UNIX COMMANDS AND CONCEPTS, of the text. Students should be taught about the Linux directory structure and the advantages of keeping their files in well structured directories. Since they will be using the command line interface most of the time, this entails facility in using such commands as mkdir, pwd, cd, ls, cp, mv, ls and so on.

### **Module 2**

Text : L<sup>A</sup>T<sub>E</sub>X Tutorials—*A Primer* by Indian TeX Users Group

In this module, we discuss computer typesetting using L<sup>A</sup>T<sub>E</sub>X, Chapters 1-2 of the text must be discussed in full. On bibliography, only the first section of Chapter 3 need be discussed. Also, only the first section of Chapter 4—on table of contents—need be done. Chapters 6-9 are to be done in full. Finally Chapter 12 also is to be discussed in full.

### **Module 3**

Text : Vernon L. Ceder, *The Quick Python Book*, Second Edition, Manning

It is based on Chapters 3-9 of the text. The concepts in Chapters 3-8 must be discussed in full, but in Chapter 9, only Sections 9.1-9.5 need be discussed.

The programs done in class should all have a mathematical content. Some possibilities are listed below:

- Factorial of a number
- Checking primality of a number
- Listing all primes below a given number
- Prime factorization of a number
- Finding all factors of a number
- GCD of two numbers using the Euclidean Algorithm
- Finding the multiples in Bezout's Identity

Distribution of instructional hours:

Module 1: 30 hours; Module 2: 30 hours; Module 3: 30 hours

## **Elective Course**

### **15UMM661.1: Graph Theory (Elective)**

**No. of credits: 2**

**No. of instructional hours per week: 3**

Overview of the Course: The course has been designed to build an awareness of some of the fundamental concepts in Graph Theory and to develop better understanding of the subject so as to use these ideas skillfully in solving real world problems.



### Module 1

A brief history of Graph Theory: The Königsberg bridge problem, the history of the **Four Colour Theorem for maps**, Contributions to Graph Theory by Euler, Kirchoff, Cayley, Mobius, De Morgan, Hamilton, Erdős, Tutte, Harary, etc. (A maximum of three hours may be allotted to this sub-module. In addition to sections 1.2 and 1.6 of the text, materials for this part can be had from other sources including the internet.) Graphs: Definition of graph, vertex, edge, incidence, adjacency, loops, parallel edges, simple graph. Representation of graphs, diagrammatic representation, matrix representation (adjacency\* matrix and incidence matrix only). Finite and infinite graphs, Definition of directed graphs, illustrative examples, Directed graphs, **Applications of graphs**. [sections 1.1, 1.2, 1.3, 1.4, 7.1, 9.1, 9.2] Degree of a vertex, odd vertex, even vertex, relation between sum of degrees of vertices and the number of edges in a graph, and its consequence: number of odd vertices in a graph is even. Isolated vertex, pendant vertex, null graph, complete graphs [page 32], bipartite graphs [page 168], complete bipartite graph [page 192-prob 8.5], regular graph, complement\* of a graph, graph isomorphisms, self complementary\* graphs, illustrative examples. [sections 1.4, 1.5, 2.1] Sub-graphs, edge disjoint sub-graphs, spanning sub-graphs\*, induced subgraphs [sections 2.2] The decanting problem and its graph model [no solution at this point]. **The puzzle with multicolour cubes** [problem 1.8 and section 2.3].

### Module 2

Walks, open walks, closed walks, paths, circuits, end vertices of a path, path joining two vertices, length of a path, connected and disconnected graphs. Components of a graph. [sections 2.4, 2.5] Euler line, Euler graph, unicursal line, unicursal graph, characterisation of Euler graph, Concept of Euler digraph [section 2.5, 9.5], **Solution of the decanting problem. The Königsberg problem, the Chinese postman problem\* and the Teleprinter's problem, their graph models and solutions.** [problem 1.8 and sections 2.3, 1.2, 9.5]

### Module 3

**Trees**- properties of trees, distance, eccentricity, center, radius, diameter, spanning tree, illustrative examples. [sections 3.1, 3.2, 3.3, 3.4, 3.7] Planar graphs examples of planar and non-planar graphs, different representations of a planar graph. Regular polyhedra, Euler's polyhedral formula. [Theorem 5.6, without proof].

Illustrative examples, Kuratowski's graphs and their importance in the theory of planar graphs, forbidden sub-graph, characterisation of planar graph [Kuratowski's theorem, Theorem 5.9, without proof], illustrative examples-both planar and non-planar. [sections 5.2, 5.3, 5.4, 5.5] **Graph theoretic version of the Four Colour Theorem**, without proof.

Text: NarsinghDeo: Graph Theory with applications for Engineering and Computer Science, Prentice Hall of India Pvt. Ltd., 2000.

#### References:

1. Balakrishnan R and Ranganathan: *A Text Book of Graph Theory*, Springer
2. Bondy J A and Murthy U S R: *Graph Theory with Applications*, The Macmillan Press

3. Harary F: *Graph Theory*, Addison-Wesley
4. Vasudev C: *Graph Theory with Applications*
5. West D B: *Introduction to Graph Theory*, Prentice Hall of India Pvt. Ltd.

Note: Generally, the references are from NARSINGH DEO. Those marked with an asterisk are found elsewhere.

Distribution of instructional hours:

Module 1: 18 hours; Module 2: 18 hours; Module 3: 18 hours

### Elective Course

### 15UMM661.2: Fuzzy Mathematics (Elective)

**No. of credits: 2**

**No. of instructional hours per week: 3**

#### Module 1

FROM CRISP SETS TO FUZZY SETS: A PARADIGM SHIFT. Introduction-crisp sets: an overview-fuzzy sets: basic types and basic concepts of fuzzy sets, Fuzzy sets versus crisp sets, Additional properties of cuts, Representation of fuzzy sets.

#### Module 2

OPERATIONS ON FUZZY SETS AND FUZZY ARITHMETIC: Operations on fuzzy sets-types of operations, fuzzy complements, fuzzy intersections, t-norms, fuzzy unions, t-conorms.

Fuzzy numbers, Linguistic variables, Arithmetic operations on intervals, Arithmetic operations on fuzzy numbers.

#### Module 3

FUZZY RELATIONS: Crisp versus fuzzy relations, projections and cylindric extensions, Binary fuzzy relations, Binary relations on a single set, Fuzzy equivalence relations.

Text: George J Klir and Yuan: Fuzzy sets and fuzzy logic: Theory and applications, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

Chapter 1: Sections 1.1 to 1.4

Chapter 2: Sections 2.1 and 2.2

Chapter 3: Sections 3.1 to 3.4

Chapter 4: Sections 4.1 to 4.4

Chapter 5: Sections 5.1 to 5.5

References:

1. Klir G J and T Folger: *Fuzzy sets, Uncertainty and Information*, PHI Pvt.Ltd., New Delhi, 1998
2. H J Zimmerman: *Fuzzy Set Theory and its Applications*, Allied Publishers, 1996.

3. Dubois D and Prade H: *Fuzzy Sets and Systems: Theory and Applications*, Ac.Press, NY, 1988.

Distribution of instructional hours:

Module 1: 18 hours; Module 2: 18 hours; Module 3: 18 hours

### **Elective Course**

### **15UMM661.3: Mechanics (Elective)**

**No. of credits: 2**

**No. of instructional hours per week: 3**

#### **Part A: STATICS**

##### **Module 1**

Introduction, composition and resolution of forces, parallelogram law of forces, triangle law of forces, Lami's theorem, polygon of forces,  $\Sigma \mu$  theorem, resultant of a finite number of coplanar forces acting upon a particle, conditions of equilibrium, parallel forces, resultant of two parallel forces acting upon a rigid body, moments, moments of a force about a point and about an axis, generalized theorem of moments.

##### **Module 2**

Couples, equilibrium of a rigid body acted on by three coplanar forces, general conditions of equilibrium of a rigid body under coplanar forces, friction, laws of friction, limiting friction, coefficient of friction and simple problems.

#### **Part B: DYNAMICS**

##### **Module 3**

Velocity, relative velocity, acceleration, parallelogram laws of acceleration, motion under gravity, Newton's laws of motion and their applications to simple problems. Impulse, work, energy, kinetic and potential energies of a body, principle of conservation of energy.

##### **Module 4**

Projectiles, Range on an inclined plane, Collision of elastic bodies, Newton's experimental law, Impact of sphere on a plane, Direct and oblique impact of two spheres, Loss of kinetic energy by impact, Simple harmonic motion, Examples of simple harmonic motion, Simple pendulum.

Text: by S.L. Loney, *The Elements of Statics and Dynamics*, Part-I and Part-II, AITBS Publications and distributions (Regd), Delhi

Distribution of instructional hours:

Module 1: 15 hours; Module 2: 12 hours; Module 3: 15 hours, Module 4: 12 hours



