4:1.0)

j) Approval of the Pre-University Syllabi

The 49th Academic Council held on 21st and 22nd November 1994 deferred consideration of the Pre-University Syllabi for want of the minutes of the Pre-University Board held on 26th October 1994. The minutes of the Pre-University Board and modified Pre-University Syllabi as modified by the concerned Subject Expert Committees are submitted for consideration of the Council.

Following modified Syllabi are submitted for consideration of the Council:-

Garo (MIL), Garo (Elective), Statistics, Nepali (MIL), Nepali (Elective), Mizo, Economics, Khasi, Assamese (MIL), Assamese (Elective), Anthropology, Physics, Geography and English.

Following syllabi are submitted for consideration of Academic Council which have been accepted by Pre-University Board without any modification :-

Public Administration, Chemistry, Education, Sanskrit, Latin, Biology, Logic, History, Home Science, Political Science, Mathematics, Commerce, Psychology.

4 : 1(2)

Garo Syllabus for P U to be effective from 19993

M. I. L

Time : 3 Hours

Maximum Marks : 100

Distribution of Marks :-

1.	Prose	:	35 marks
2.	Poetry	:	35 marks
3.	Garo Grammer, proverbs & Phrases	:	30 marks

TEXT BOOKS :

1. Mihir N Sangma : Maniani Bidik

. The following pieces have been selected :

(i) Gamma Ge'ani Bidingo A'chikragni Maniani Rang
(ii) Mangona
(iii) Siao bon'ao A'chikrangni Dakbewalrang
(iv) Amua ba Krita
(v) Do'sia ba Do'doka
(vi) Asimalja
(vii) Salpang Sim'a ba Salgrua ba Salak Tata
(viii) Nokpante

2. D S Nengminza Seokgimin Poetryrang (Compiled)

The following pieces have been selected :

(i) Sallingni Agana (Traditional Narration)
(ii) Jonmoni D Shira : Basako
(iii) Karnesh R Marak : Man'rikani
(iv) Koplane G Momin : Miktoksi
(v) Jonmoni D Shira : Miksongani
(vi) Kosan G Momin : Kamnia Bite
(vii) Kosan G Momin : Sengwat
(viii) M Rongmity : Randi Me'chikni Sintia
(ix) Evelyn R Marak : Hobani Sinteani
(x) H D Momin : A'chik Ku'rang
(xi) H D Momin : Nang'ko gisik Ra'gen
(xii) Edwin Bangshall : Ripok Do' Katchi
(xiii) Kosan G Momin : Gamgipa
(xiv) Anonymous : Nang'ni Jako
(xv) Anonymous : Skiani

3. Rev E G Phillips : Garo Grammar

4. M S Sangma & J L R Marak : Agan Me'apa
5. J L R Marak & M S Samgna : Ku'jikse

ELECTIVE

Paper I : Prose and Poetry

Maximum Marks : 100 Time : 3 Hours

Distribution of Marks :

1. Prose : 50 marks
2. Poetry : 50 marks.

Books Orescribed :

1.	Lindrid D Shira	:	Kadimgimin Seanirang, Bk II
	The following pieces have been selected :		
(i)	Heroine Bangshall	:	Ka'donggipa Mande
(ii)	Venibabe N Sangma	:	Mahatma Gandhii Namgipa aro Kakket gipa Chanchianirang.
(iii)	Evelyn R Marak	:	Me'chikko Noko Ra.ani
(iv)	Lelewellyn R Marak	:	Balpakram
(v)	Milton S Sangma	:	David Scott aro Bini Nama Kamrang
(vI)	Mackenson Rongmuthu	:	Changsao Dakgrikram A'bao Krismas Solo.
(vii)	Dewangsing Rongmuthu	:	Chengoni A'chik Kattarang
(viii)	Keneth M Momin	:	Jakgitelni Bil aro Miksong ani
(ix)	Aldrich Ch. Momin	:	A'song Den'a
(x)	Lindrid D Shira	:	Kangalni Bal'gipa Mande Ong'ani
2.	Keneth M Momin (complied)	:	Chasong Gital A'chik Poetryrang
	The following pieces have been selected :		
(i)	S S Marak	:	Bidan Chimik
(ii)	S S Marak	:	A'songtangna Sintia
(iii)	M Rongmuthu	:	Oh Sia
(iv)	N R Sangma	:	Norombi
(v)	M Rongmuthu	:	Anga Saksan Pangnan Saksan
(vi)	K M Momin	:	Teng Ja jongo
(vii)	B S Bangshall	:	Ritimaia
(viii)	B S Bangshall	:	Chaasia
(ix)	M Rongmuthu	:	A'gilsak Dalbegipa Aldanok
(x)	M Rongmuthu	:	AmanKu'sik

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4:1(2)

Garo Syllabus for P U to be effective from 1993

M. I. L

Time : 3 Hours

Maximum Marks : 100

Distribution of Marks :-

1. Prose : 35 marks
2. Poetry : 35 marks
3. Garo Grammer, proverbs & Phrases : 30 marks

TEXT BOOKS :

1. Mihir N Sangma : Maniani Bidik

. The following pieces have been selected :

(i) Gamma Ge'ani Bidingo A'chikragni Maniani rang
(ii) Mangona
(iii) Siao bon'ao A'chikrangni Dakbewalrang
(iv) Amua ba Krita
(v) Do'sia ba Do'doka
(vi) Asimalja
(vii) Salpang Sim'a ba Salgrua ba Salak Tata
(viii) Nokpante

2. D S Nengminza Seokgimin Poetryrang (Compiled)

The following pieces have been selected :

(i) Sallingni Agana (Traditional Narration)
(ii) Jonmoni D Shira : Basako
(iii) Karnesh R Marak : Man'rikani
(iv) Koplane G Momin : Miktoksi
(v) Jonmoni D Shira : Miksongani
(vi) Kosan G Momin : KamnaBite
(vii) Kosan G Momin : Sengwat
(viii) M Rongmity : Randi Me'chikni Sintia
(ix) Evelyn R Marak : Hobani Sinteani
(x) H D Momin : A'chik Ku'rang
(xi) H D Momin : Nang'ko gisik Ra'gen
(xii) Edwin Bangshall : Ripok Do' Katchi
(xiii) Kosan G Momin : Gamgipa
(xiv) Anonymous : Nang'ni Jako
(xv) Anonymous : Skimai

3. Rev E G Phillips : Garo Grammar

4. M S Sangma & J L R Marak : Agan Me'apa

5. J L R Marak & M S Samgna : Ku'jikse

ELECTIVE

Paper I : Prose and Poetry

Maximum Marks : 100 Time : 3 Hours

Distribution of Marks :

1. Prose : 50 marks

2. Poetry : 50 marks.

Books Orescribed :

1. Lindrid D Shira : Kadimgimin Seanirang, Bk II

The following pieces have been selected :

(i) Heroine Bangshall : Ka'donggipa Mande

(ii) Venibabe N Sangma : Mahatma Gandhii Namgipa aro Kakket gipa Chanchianirang.

(iii) Evelyn R Marak : Me'chikko Noko Ra.ani

(iv) Lelewellyn R Marak : Balpakram

(v) Milton S Sangma : David Scott aro Bini Nama Kamrang

(vI) Mackenson Rongmuthu : Changsao Dakgrikram A'bao Krismas Solo.

(vii) Dewangsing Rongmuthu : Chengoni A'chik Kattarang

(viii) Keneth M Momin : Jakgitelni Bil aro Miksong ani

(ix) Aldrich Ch. Momin : A'song Den'a

(x) Lindrid D Shira : Kangalni Bal'gipa Mande Ong'ani

2. Keneth M Momin (complied) : Chasong Gital A'chik Poetryrang

The following pieces have been selected :

(i) S S Marak : Bidan Chimik

(ii) S S Marak : A'songtangna Sintia

(iii) M Rongmuthu : Oh Sia

(iv) N R Sangma : Norombi

(v) M Rongmuthu : Anga Saksan Pangnan Saksan

(vi) K M Momin : Teng Ja jongo

(vii) B S Bangshall : Ritimaia

(viii) B S Bangshall : Chaasia

(ix) M Rongmuthu : A'gilsak Dalbegipa Aldanok

(x) M Rongmuthu : AmanKu'sik

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REVISED SYLLABI FOR PRE-UNIVERSITY (STATISTICS)

S T A T I S T I C S

P A P E R - I

Unit - 1

Permutations and Combinations (Theorems with proofs and examples), Mathematical Relation between Permutation and Combination. Binomial Theorem for positive integral index (without proof), Binomial coefficients and their simple Applications. Logarithms. Exponential and Logarithmic Series (without proof) with their simple examples.

Unit - 2

Functions and their graphs, Limits of functions. Derivatives, Fundamental rules of differentiations of sums, products and quotients of functions, Function of functions, Derivatives of inverse trigonometrical functions, Derivatives of implicit and parametric functions.

Integration defined as the inverse of differentiation, Definite integration with simple examples.

Unit - 3

Definition, Scope and Limitations of Statistic. Collection, Classification and Tabulation of data, Primary and Secondary data, Diagrammatic Representation of Statistical Data. Graphical Representation of Statistical Data. Measures of central Tendency. Measures of Dispersion.

Unit - 4

Skewness, Kurtosis and Moments Correlation, Karl Pearson's Coefficient of correlation, Its limit. Rank correlation, Spearman's rank Correlation Coefficient.

Unit - 5

Regression, Fitting of straight line by principle of least squares, consistency and Association of attributes (two attributes only). Definition of Linear Programming Problem with simple examples, its Formulation, Graphical solution of Linear Programming Problem (upto two variable only).

N.B. Ten questions to be set taking two questions from each unit. Five questions in all to be attempted taking one question from each unit.

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PAPER - II

Unit - 1

Random Experiment, Sample Space (finite). Simple and Compound events. Relation among events, Basic assumptions and definition of probability. Theorem on Total probability (two events only). Conditional probability, Compound theorem of probability (two events only), Independence of events.

Unit - 2

Random variable, Probability mass function. Expectation, Moment generating function, Theorems on expectation of sum and product of several random variables with proof.

Bernoulli trials, Binomial and Poisson distributions (Definition, expression for mean and variance, properties and examples) Definition of Hypergeometric distribution and its relation to Binomial distribution (Its moments not necessary), Its uses.

Unit - 3

Δ , E and ∇ Operators, their relations, simple problems on Δ and E Operators, construction of Forward Difference Table and Backward Difference Table. Missing Term, Meaning of Interpolation and Extrapolation, Newton's forward and backward interpolation formulae for equal intervals.

Divided difference, Lagrange's interpolation formula with numerical applications. General quadrature formula. Trapezoidal and Simpson's one-third rules of numerical integration.

Unit - 4

Introduction and Historical development of Computers, Binary number system. Conversion of Binary number to decimal system and vice-versa. Binary arithmetic logicgates, Computer Organisation and Basic structure. Characteristics of Computer, Computer terminologies, Computer application.

Unit - 5

Definition, Its construction and Uses. Simple and Weighted relative of aggregates and averages of relatives. Laspeyre's, Paasche's, Marshall-Edge Worth's and Fisher's Index number Formulae. Death and Fertility rates.

N.B. Ten questions to be set taking two questions from each unit. Five questions in all to be attempted taking one question from each Unit.

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TEXT BOOKS (FOR BOTH PAPER)

1. Fundamentals of Mathematical Statistics by S.C. Gupta and V.K. Kapoor. Sultan Chand and Sons, New Delhi.
2. Fundamentals of Applied Statistics by S.C. Gupta and V.K. Kapoor. Sultan Chand & Sons, New Delhi.
3. Examples in Finite Differences and Numerical Analysis by H.C. Saxena, S. Chand & Co., New Delhi.
4. Operation Research by K. Swarup, P.K. Gupta and Man Mohan. Sultan Chand & Sons, New Delhi.
5. College Algebra : by Mazumdar & Gangyly (Orient Book Co., Calcutta
6. Programming and Computing in FORTRAN IV by P.S. Grover. Allied Publisher Private Limited.
7. Higher Secondary Calculus : by Das & Mukherjee, World Press, Calcutta.

REFERENCE BOOKS (FOR BOTH PAPER)

1. Fundamentals of Statistics Vol. I by Goon, Gupta and Das Gupta, World Press, Calcutta.
2. Fundamentals of Statistics Vol. II by Goon, Gupta and Das Gupta, World Press, Calcutta.
3. Statistical Methods by J. Medhi, Wiley Eastern.
4. Statistical Concepts and Methods by Bhattacharya & Johnson, Wiley International.
5. Basic Statistics by Goon, Gupta and Das Gupta, World Press, Calcutta.
6. Basic Statistics by Simpson & Kafka.
7. Introduction to Computer Science by T. Bartee, Mc. Graw Hill Book Co.
8. Computer Science : A first course by Forsythe et. al. John Wiley & Sons.

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NEPALI (M.I.L.) 4:1(8)

Distribution of Marks -- (Poetry - 35, Prose - 35 and Grammar - 30)

Text — NEPALI NAVIN SANKALAN Edited by Gopi Narayan Pradhan and Nar Bahadur Rai.

POETRY — 35

(a)	Prasnottar	---	Bhanubhakta Achary
(b)	Satya Sandesh	---	Lekhnath Paudyel
(c)	Yatri	---	Laxmi Prasad Deokota
(d)	Timro Basita Paisa Chaina	---	Siddhicharan Shrestha
(e)	Kritag-Yata Smriti.	---	Ram Prasad Upadhaya
(f)	Saisawa	---	Agam Singh Giri
(g)	Dui Samre Judhehan	---	Lakhi Devi Sundas
(h)	Bhara-Ghar	---	Gopi Narayan Pradhan
(i)	Aaj Jiwanko Anta	---	Hari Bhakta Katuwal

PROSE -- 35

Text -- (i) MUKUND INDIRA by Bal Krishna Sam
(ii) NEPALI NAVIN SANKALAN — Edited by Gopi Narayan Pradhan & Nar Bahadur Rai

The following pieces :-

ESSAY —

(a)	Bani	————	Bal Krishna Sam
(b)	Mary Sishu	————	Laxmi Prasad Deokota
(c)	Vangog Ko Chihan	——	L.S.Bangdel
(d)	Nepali Sahityama Ukhan Ko Sthan.	——	Parasmani Pradhan
(e)	Voltaire	————	Raj Narayan Pradhan

SHORT STORY —

(a)	Macha Ko Mol	---	Shiv Kumar Rai
(b)	Buddhiman Correl	——	Parsuram Roka
(c)	Ratbhari Huri Chalio	——	Indra Bahadur Rai
(d)	Gorkha Ko Model	———	Hari Prasad Gorkha Rai

GRAMMAR — 30

(Grammar & Composition -- 15 and Essay -- 15)

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NEPALI(ELECTIVE) 4:1(9)

First Paper

Distribution of Marks -- (Prose - 50 and Poetry - 50)

Text Book —— NEPALI NAVIN SANKALAN Edited by Gopi Narayan Pradhan & Nar Bahadur Rai.

PROSE — 50

(a) Bhani Bisawney Thego --- Shiv Kumar Rai
(b) Birseyko Sanskriti ---- M.M. Gurung
(c) Lok Sahityama Sawaiko Sthan. ---- Jagat Chettri
(d) Abraham Lincon ------ Raj Narayan Pradhan
(e) Pawitra ---------- Bisweshore Prasad Koirala
(f) Theo Feari Farkala ------- Bhawani Bikshu
(g) Mrituikai Mukhenji ------ Parsuram Roka
(h) Mero Ragat, Mero Mutu ---- M.M.Gurung
(i) Lahurey Bhainsi -------- Ramesh Bikal.

POETRY — 50

(a) Jiwan Jyoti ------- Lekhnath Paudyal
(b) Sahitya Sudha ------- Dharnidhar Koirala
(c) Ke Thesko Kavita Lakhun ---- Bal Krishna Sam
(d) Bhikari ---------- Laximi Prasad Deokota
(e) Rastra-Rachana ---------- Puspalal Upadhya
(f) Sahityik Holi --------- Tulsi Apatan
(g) Mero Kavita --------- Agam Singh Giri
(h) Ma ta Salig Nai Bhaideyen -- Lakhi Devi Sundas
(i) Ayo Naya Sal Ani Feri Ayo Naya Sal. -- Gopi Narayan Pradhan
(j) Ma Maris Hun ---------- Har Bhakta Katuwal

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NEPALI(ELECTIVE)

Second Paper

Distribution of Marks --- (Fiction - 40, Drama - 20 and Grammar - 40)

FICTION --- 40

LANGARAKO SATHI ---- L.S. Bangdel
Published by Ratna Pustak Bhandar.

DRAMA --- 20

MASAN ---- Gopal Prasad Rimal
Published by Saja Prakasan.

GRAMMAR --- 40 (Grammar and Composition -- 25 & Essay--15)

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4:1(10)

NORTH EASTERN HILL UNIVERSITY

Revised Pre-University Syllabus in Mizo

I.MIZO M.L -100 marks A.Poetry/Hla -35 marks
B.Prose/Thu -35 marks
C.Grammer -30 marks

A.Poetry/Hla - 35 marks

i)Pathian Fakna: (a)Thu mak ka sawi nin theih lo..-Liangkhaia
(b)Jerusalem Zion Khawpui -Suakliana
ii)Lengzem : (a)Tleitirah tleitiri -Durra Chawngthu
iii)Lenglawng : (a)I hun i hmang tha em - Rokunga
(b)Khawtlang lunglen - Vankhama
(c)Lungdawh Hla -V.Hawlla
iv)Ram hmangaihna: (a)Kan zo tlang ram nuam-Rokunga
v)Khawhar hla: (a)Ngaiin ka au zel dawn- Romani

B.Prose/Thu : 35 marks

i)Mizo inneih dan: K.Zawla
ii)Val Upa Darchhawna
iii)Thangkima Khuangchawi thu Ranga(Remsangpuii Pa)
iv)Kalkhama leh Lianphunga(Mizo lalte): Lalthangfala Sailo
v)Indopui II C.Chhuanvawra
vi)Zonun Zepui B.Lalthangliana
vii)Ka Zawhte dum C.L.Dinga

C.Grammer: 30 marks

i)Mizo Tawng Grammer: Synod Publication Board - 20 marks
ii)Pipute Tawngkauchheh(Bung 17 & 18 chauh)- 10 marks

Note: Zirlaibu pakhatah A & B zawng hi dahkhawm tur ani ang.

II.MIZOELECTIVE PAPERS

Paper I: A.Poetry/Hla ; 50 marks
B.Prose/Thu : 50 marks

Paper II A.Fiction/Thawnthu: 40 marks
B.Drama/Lemchan :20 marks
C.Literary Criticism and History of Literature:40 marks

PAPER I -100 marks

A.Poetry/Hla : 50 marks

i) Hla Hlui- 15 marks
(a)Lianchhiari Zai - Chang 5
(b)Darpawngi Zai - Chang 5
(c)Puma Zai - Chang 5
(d)German Run - Chang 5

ii) Tunlai Hla- 35 marks
(a)Pathian Fakna: 1.Pathian engkin hriatzia- Sam No.139
2.Sual Sipai ral nen -Laithangpuia
(b)Lengzem : 1.Par ang a vul -Lalzova
2.Laikhum zala ka dawn pawhin-Vankhama
(c)Khuarel Hla: 1.Phengphe nunnem -Zirsangzela
2.Au ral ral chu mihring-Ja es Dokhuma
(d)Ram Hmangaihna:Chhaktiang Kawlrawn - T.Zorampela
(e)Thawnthu Hla: 1.Utawk leh Chhak - P.S.Chongthu
2.Sibuta lung -Lalsangzuali Sailo
(f)Lenglawng: 1.Lei miten hunbi an chhiar e-Rokunga
2.Pipu Chhuahtlang hlui- Liandala

cont-

B.Prose/Thu -50 marks

i)A no ber mai, no ber mai	-	Zairema
ii)Sibai	-	Zikpuii-Pa
iii)Anni leh Keini	-	A.Siamkima Thawlhring
iv)Hmangainna	-	Lalhmingliana Saiawi
v)Sakhua leh hnam nunphung	-	Rinsanga
vi)Thawnthu Hlutna		B.Lalthangliana
vii)Mizo nula huaisen pahnih	-	R.L.Thanmawia

PAPER II - 100 marks

A Fiction/Thawnthu - 40 marks

i)Lali -	L.Biakliana
ii)Chhingpuii-	Kaphleia
iii)Leitlang Dingdi-	C.Thuamluaia

B.Drama/Lenchan - 20 marks

1)Sangi Inleng -	Lalthangfala Sailo

C.Literary Criticism & History of Literature- 40 marks

Literature Zirtirtu (Principles of literature with reference to Greek, English & Mizo Language Literature)
- Laltluangliana Khiangte

Note:Poetry & Prose huang atana thlan chhuah hote hi Zirlaibu pakhata dahkhawm tur a ni ang

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4:1(12)

PRE-UNIVERSITY SYLLABUS

ECONOMICS

(First Paper - First Year)

Group 'A' : Economic Theory

Unit-1 : Basic Concepts: Utility, Goods (Free and Economic), Wealth, Welfare, Capital, Value, Price, Income, Consumption and Production.

Human Wants : Characteristics and Types

The Law of Diminishing Marginal Utility

Unit-2 : Production: Four Factors of Production
Land: Meaning and Characteristics
Labour: Meaning and Characteristics
Capital: Meaning and Characteristics
Enterprise and Organisation: Its Role in Modern Firm

Division of Labour: Advantages and Disadvantages

Unit-3 : Public Finance: Meaning, Distinction Between Public and Private Finance, Sources of Public Revenue, Direct and Indirect Taxes, Characteristics of Good Tax System, Public Debt: Meaning, necessity and classification.

Unit-4 : Concepts and Characteristics of Capitalism, Socialism and Mixed Economies

Group 'B' : Problems of Indian Economy

Unit-1 : Meaning and characteristics of Underdeveloped Countries
Basic Features of the Indian Economy
Natural Resources of the North-Eastern Region

Population: Malthusian and Optimal Theories of Population
Pattern and Growth of Population in India
Causes for Population Explosion in India
Control of Population Growth
Population and Economic Development in India
Pattern and Growth in Population in the North-Eastern Region

Unit-II: National Income of India

Meaning of National Income
Trends and Growth in India's National Income
Sectoral Distribution of India's National Income

Unit-III: Agriculture in India

Role of Agriculture in India
Problems of Agricultural Development in India
Agricultural Credit: Sources and Agencies disbursing credit in India
Land Reforms : Scope and Contents

4:1(13)

(Second Paper - 2nd Year)

Group 'A' : Economic Theory

50 Marks

Unit-I : Demand and Supply
Meaning of Demand, Law of Demand, Change and Shift in Demand
price Elasticity of Demand, Factors Determining Elasticity of Demand
Meaning of Supply, Law of Supply

Unit-II : Costs, Revenue and Markets
Distinction Between Total Variable Cost, Total Fixed Cost
Average Fixed Cost, Average Variable Cost, Marginal Cost
Distinction Between Total Revenue, Average Revenue and Marginal Revenue
Market Forms; Characteristics of Pure and Perfect Competition
Pure Monopoly
Discreiminating Monopoly
Monopsony
Oligopoly
Monopolistic Competition (Chamberlain)
Imperfect Competition (Joan Robinson)

Unit-III: Factor Pricing
Rent: Meaning of Economic Rent, Quasi Rent, Ricardian Concept of Rent
Wages: Real and Nominal, Factors Influencing Real Wages
Interest: Gross and Net Interest
Profit: Residue Theory

Unit-IV : Money and Banking
Limitations of Barter System
Origin of Money, Functions of Money, Types of Money
Gresham's Law of Money
Central Bank: Functions
Commercial Banks: Functions

Group 'B' : Problems of Indian Economy

Unit-1 : Industrial Development in India
Industrial Policy Resolutions of 1948 and 1951
Growth of Mixed Economy
Role of Cottage and Small Scale Industries
Problems faced by Cottage and Small Scale Industries
State Policy Towards Cottage and Small Scale Industries

Unit-2 : Unemployment problem in India
Nature, Extent and Types of Unemployment in India
Employment Strategy to tackle rural unemployment and unemployment among the educated

Unit-3 : India's Foreign Trade
Major items of import and export
Direction of India's Foreign Trade

4:1(14)

Unit-4 : Economy of the North-Eastern India:
Broad Features
Problems of Economic Development in the Region
Extent of Jhum Cultivation in this Region
Measures to prevent Jhum cultivation
Promotion Tourism Industry in this Region

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4:1(15)

MINUTES OF THE EXPERT COMMITTEE FOR REVISION OF P.U.SYLLABUS (KHASI) WHICH MET ON 27-9-95 IN THE OFFICE CHAMBER OF THE HEAD DEPARTMENT,KHASI.

1. Members Present:

Dr.(Mrs) M.B.Jyrwa	-	Convener
Dr.(Mrs) B.War	-	Member
Mr.S.S.Majaw	-	..

2. The Committee was opened with words of welcome from Convener after which the agenda namely Re-Consideration of P.U.Syllabus for Khasi according to norms spelt out by P.U.Board of Education was thrown open for discussion.

3. After due consideration the Expert Committee decided to make the following changes in the proposed P.U. syllabus (as proposed on 22.9.94).

M.I.L.

Unit I: Poetry

Marks : 35

Lectures: 40

Texts as follows:

1. K.A.S. Na Ka Thiar Ki Longshuwa
   " U Topa " (S.Amjad Ali)
   " Ko Rangkynih" (U Rabon Singh)
   " Ka Jingrwai Jumai " (U Nongthoh)
   " Ka Jingbynnud ia u Babu Jeebon Roy (R.S.Berry)
   " Ka Salm Ka Jingim " (John Roberts)
   " U Immanuel " (Sonnet) (Anon)

2. Pugh,F.M. Phavar Rwai Khasi
   " Rwai Ieit Ri " " Elekshon "

3. Bareh, V.G. Ki Poetry Khasi
   " U Tiewdohmaw ha Shiteng Riat " " Ka Kalikai "
   " Hapdeng Ki Law Kynjah Ka Tlang "

4. Jyrwa,B.C. Na Nengpei Ki Sur Myllung
   " Ka Sor Shillong " " Um Dei U Nongthaw "

5. Majaw,S.S. Ha Ki Sur Ka Poetry
   " Ka Nusib Shiew "

Unit II : Prose
Marks : 35
Lectures: 40
Texts as follows:

6. Elias.H. Mihrgi Sepngi
" Ki Jingrwai la ka Ri " " Ka Trei ka Ktah ha Ri Khasi-Jaintia " "Badonburom" " Ka Jingsngewtynnad jong ka Jingpule Kot "

7. Duncan,S.J. Phuit Ka Sabuit
" Ka Akor Kaba Tam " " Bthei Skei "
" U Men Mali "

8. Malngiang,Pascal, Ksan Rympei Rem Dorbar

Unitt III : Grammar & Composition.
Marks : 20 + 10 (30)
Lectures : 20

Texts as follows:

9. Sten,H.W. Ka Grammar
Chapters II,III,IV,VI,VIII.

10. Essay on Topics related to Khasi Literature.

Elective I

Unit I : Fiction
Marks: 40
Lectures : 45
Texts as follows:

1.Roberts,John. Khasi Fourth Reader
" U Jak bad u Jyntang Bin - I,
II,
III,
IV,
V "
"Ka Jingithuhpaw U Mirsa- I
II "

Contd/-page-3.

2.Lartang,Kremlin : Ka Jylli Umsnam

Unit III: Drama
Marks: 20
Lectures : 20.
Texts as follows:

3.Phankon,Remy: Mynhynnin,Mynta,Lashai,
" Ka Sngi Khadduh u Tirot Singh " " Elekshon "

Unit III: History of Khasi Literature.
Marks: 20
Lectures: 15
Texts as Follows:

H.Lyngdoh,R.S. Ka Histori ka Thoh ka Tar,Bynta I
(i) Traditional Period (Before 1800)
(ii) William Carey
(ii) Krishna Chandra Pal
(iv) Alexandar Lish

Unit IV: Literary Critism
Marks: 40
Lectures: 20
Texts as follows:

5.Sten,Swer,War, Ki Snap Ka Bishar Bniah
6.Swer,B.L. Shaphang ka Sonnet Chapters I.

Elective II
Unit I : Poetry
Marks: 50
Lectures: 45
Texts as follows:

1.Tham,Soso, Ka Duitara Ksiar
" Ki Ar Pyngngad ki Aw " " U Trot "

2.Duncan,S.J. Ka Tiew Larun bad kiwei pat ki syntiew
." Na u Lum Nga Peit " " U Riew Shynrang "

3.Wolflang,C. Ki Sur Phalang Jingmut
" Shaphrang Nang Kiew " " Rympei "

4.Dkhar,E.W. Ki Siej Khongpong Bynta-I
5.Sien,H.W. Burom Ba La Jah, Bynta-I.
6.Majaw,S.S. Ka Tragoida bad ki Poim. " Ummat ka Jingieit *

Contd/.page4.

Unit II: Prose
Marks; 50
Lectures: 45.

Texts as follows:

7.Gatphoh,P. Ki Umjer Ksiar
" Shaphang Ka Akor " " Ka Du Ka Tang bad Ka Rem "
" Ki Mawjam Sha Ka Nam "

8.Khongdup,D.S. Ha Ki Sngi U Syiem
" Ki Nongap Masi U Syiem ha Sor Shillong "
" U Khun Ka Nongdie Phlang "

9. Rynjah,Sweetymon, Tyngkai la ki Symbai
" U Khun ki Briew - U Kpa Ka Iing "
" Ka Kha Ka Man - Ka Kmie Ka Iing "

4. With the above proposal as Revised P.U.Syllabus for Khasi, the Expert Committee observed the following regarding Objective Type Questions for P.U.

(i) That Paper Setters be required to provide Model Answers to assertain consistency in making of papers by concerned examiners.

5.There being no other item on the agenda, the convener closed the Committee Meeting with a vote of thanks.

M.B.Jyrwa.
Convener.

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MARKS DIVISION :- PRE UNIVERSITY

SUB: ASSAMESE M.I.L. Descriptive + Objective.

A. PROSE	: 35	20	15
B. POETRY	: 35	15	20
D. GRAMMAR * COMPOSITION	: 15	x	15
C ESSAY		15	-
		50	50
TOTAL		= 100	

PRE-UNIVERSITY:

Sub:- Elective Assamese: 1st. Year : Marks 100 : 1st Paper.

		Descriptive	Objective.
A. Prose	: 25	15	10
B. Poetry	: 25	15	10
C. Short Story	: 20	10	10
D. Novel	: 20	10	10
E. Rhetoric Prosody	: 10	X	10

Sub:- Elective Assamese IInd. year:- IInd. paper: Marks -100

		Descriptive	Objective
A. Prose	25	10	15
B. Poetry	25	10	15
C. Drama	20	10	10
D. History of Literature	20	10	10
E. Essay	10	10	10
	100	50	50

Detailed Syllabus of
Assamese (M.I.L.) Pre-University: Full Marks:100

For the First Year:

A. Prose : Text: SAHITYA SAURAV (Published by Assam Higher Secondary Education Council Gauhati)

Following selected pieces are to be read in the First year

A. Prose : 1. MANAB MAHATTA : Satyanath Bora
2. MOR TIBAN SOWARAN : L.N. Bezbarua.
3. GOPEE UDHAVA SAMBHD : P.G. Barua.

B. POETRY: 1. UDHAVAR PRATI SRIKRISHNAR UPADESH : Sankardev.
2. BARGEET (Paravate Shyam kanu) : Madhavdev.
3. MADHURI : Agarwala.
4. KETEKI CHARAI : R.N. Chaudhury.

C. GRAMMAR: Bhava Samprasaren, use of Jatuwa- thas, Khanda-Vakya, Sentence- making.

Ref:- Book:- Bahal- Vyakaran: S.N. Bora.
Assamiya Bhasar Vyakaran :- Dr. U.N. Goswami.

.....2/-

(a)

D. ESSAY : Reference Books:- Rochana Bichitra- Dharma Singha Deka

(b) Asamiya Rachana Sankalan- Tuttul Baruah.

-x-x-x-x-x-x-x-x-x-x-

FOR IInd YEAR : ASSAMESE (M.I.L.)

A. Prose : SAHITYA SAURAV
Pices to be read :

1. Hema Sundari ; Dr. B.K. Kakoti.
2. Namghar Jatiya Natsal : Dr. B.K. Baruah.
3. Eta garam Coat : T.N. Goswami.
4. Bhartiya Adarshta Bairagya: T.N. Sarma.

B. Poetry: Sahitya Saurav :-

1. Mantharar ku-mantrana : M. Kandsli
2. Natghar : Nalini B. Devi.
3. Biswa Silpi : Joyti P. Agarwala.
4. Beer : P.L. Choudhury.
5. Batoruwa : M. Ahmed Hazarika.

C. Essay : Psactive

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Year : Pre University.

Sub:- Elective Assamese

Paper :~~1st paper 1st year~~

Text Book :-Uchattar Sahitya Sankalan (Pub. By-Assam H.S.E Council)

A. Prose:

1. Sankardever Balyakal : Katha Guru Charit.
2. Biswa Adhyan : S.N. Bora.
3. Bahag Bihur Parampara : Dr- P.D. Goswami.

B. Poetry:

1. Ramar Saite Sugrivar Mitan : M. Kandali
2. Barsa Barnan : Sankardev.
3. Tejimola : B.K. Agarwala
4. Bin- Baragi : L.N. Bezbarua.
5. Geet aru Sabi : D.S. Sarma.

C. NOVEL:

1. Bhanumati : P.D. Gohain.

D. Short Story:

Text : Uchattar Sahitya Sankalan.

1. Rakatabiz : S.C. Goswami.
2. Meghe Barasile jui : U.K. Sarma
3. Moni Orderor Taka : S.A. Malik.
4. Nakaon : L.N. Bezbarua

E. Rhetoric Prosody

(a) Alamkara - Sabdalamkara and Arthalamkara, Anuprasa, Upama, Rupaka, Jamaka.

(b) Chanda - Yati, Paiba, Carana, Stavaka, Mritakhara, Amritakhara, Pada, Dulari, Chabi, Lechari.

Reference Books:-

(a) Sahitya Bidya Parikrama - T.N. Sarma.
(b) Sahityar Saj - Sonapati Sarma

-x-x-x-x-x-x-x-x-

Sub:-

Sub:- Elective Assamese
Year:-Pre-University.
IInd paper : IInd Year : Marks - 100
Text Book:- Uchattar Sahitya Sankalan:(Pub. By Assam Higher S.E. School)

A. PROSE.

1. Asamar Ranodyum .: Satsari Asom Buranji
2. Jibonar Uparat Paribeshor Prabhab : J. Bharali.

B. Poetry:

1. Kankhowa --- Shreedhar Kandali
2. Sibor Krishikarya --- Ramsaraswati
3. Sesh Arghaya --- Nalini B. Devi
4. Janatar Ahban --- J.P. Agarwala.
5. Ananta --- J.N. Duwara.
6. Khudrar Adhiar --- R. Barkakati.
7. Batorwwa --- M. Ahmed Hazarika.

C. Drama:

1. Sakunir Psatishud --- Ganesh Gogoi.

D. History of Literature.

(a) Adunik Asariya Sahitya
i) Missonary Sakalar Awaden
ii) Janaki Jug.

Ref:Book (a) Asamiya Sahityata Drishtipat - H.K Sarma
(b) Asamiya Sahityar Itivritta

E. Essay: Books: Rachana Bichtra:Dharma G. Deka.

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PRE- UNIVERSITY

ANTHROPOLOGY

(FOR ARTS AND SCIENCE STREAMS)

PAPER : I

INTRODUCTION TO ANTHROPOLOGY

MAX:MARKS: 80

1. Introduction: History and scope of Anthropology, its relationships with other branches of science and humanities.

2. Man as a Biological Organism: Man's place in the Animal Kingdom; Man as a Primate; Characteristics and Classifications.

3. Introduction to Human Osteology; Comparative Physical characteristics of higher primates (Gorilla, Chimpanzee, Gibbon and Man).

4. Man as a cultural being: Man as a tool maker (Uniface and biface technology).

5. Man as a food producer: Hunting and Gathering, Fishing, Domestication of Animal, and Agriculture.

Number of lectures = 90

Text Books Recommended :

1. Banerjee, H.N. 1990 Introducing Social and Cultural Anthropology. Kitab Mahal Agencies, Calcutta.

2. Beals, R.L. & H. Hoijer 1957 An Introduction to Anthropology. The McMillan Company, New York.

3. Das, B.M. 1984 Outlines of Physical Anthropology. Kitab Mahal Agencies, Calcutta.

4. Saran, Gopala. 1977 Introducing Anthropology. Indian Anthropological Society, Calcutta

5. Poddar, S.& A.Bhagat 1987 Handbook of Osteology. 7th Edition Scientific Book Company, Publishers and Importers. Makhania Kuan, Patna-4.

Reference :

1. Ember and Ember, 1993 Anthropology. Prentice Hall of India, Pvt., Ltd., New Delhi.

2. Herskovits, M.J. 1954 Cultural Anthropology. Oxford& IBH, Bombay.

3. Madan T.N. & D.N. Majumdar. 1992 An Introduction to Social Anthropology. K.L. Malik & Sons, Pvt,Ltd., New Delhi.

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PRE-UNIVERSITY

ANTHROPOLOGY

(FOR ARTS AND SCIENCE STREAMS)

PAPER -II

BIO-CULTURAL EVOLUTION OF MAN

MAX MARKS:80

1. Theories of Organic Evolution: Lamarkism and Darwinism.
2. Technology and Typology of Palawolithic Tools:
   i) Technique of manufacture, Chactonian Technique, Lavallois Technique.
3. Race: Concept, formation, criteria of classification, and major races of the world.
4. Social Organisation: Family, Marriage, Kinship (Definitions, forms and functions).
5. Culture: Definition and Concept of Culture, Religion and Political Organisation.

Number of lectures: 90

Text Books Recommended:

1. Burkitt, M.C. 1977 Old Stone Age. Rupa & Company, New Delhi.
2. Sarkar, .M. 1994 Fundamentals of Physical Anthropology. Vidyadya Library Pvt.Ltd., Calcutta.
3. Mair, Lucy, 1986 An Introduction to Social Anthropology. Oxford University Press, Delhi.
4. Majumdar, D.N. & T. N.Madan. 1992 An Introduction to Social Anthropology. K.L.Malik & Sons, Pvt,Ltd., New Delhi.
5. Volpe. B.P. 1989 Understanding Evolution. Universal Book Stall, New Delhi.

Reference:

Haddon, A.C. 1922 The Races of Man. Cambridge University Press, London(Revided edition).

Bhattacharya, D.K. 1972 Pre-historic Archaeology. Hindustan Publishing Corp., New Delhi.

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PRE-UNIVERSITY

ANTHROPOLOGY

(FOR ARTS AND SCIENCE STREAMS)

PRACTICALS

MAX:MARKS:40

1. Drawing and description of instruments: Anthropometer, Rod-Compass, Sliding Caliper.
2. Somatometric Measurements: Stature, Upper and Lower arm length, Upper and lower leg length, Nasal height, Nasal breadth, sitting height.
   Indices: Nasal index, intermembral index, relative sitting height index.
3. Drawing and description of Human Skull (Normal; Occipitals, Verticalis, Frontalis).
4. Identification, drawing and description of Palaeolithic tools-(Chopper-Chopping Tools, Handaxe, Cleaver).
5. Hunting and fishing implements: Sketching and description.

Distribution of marks:
Each Unit = 6 marks (6 x 5 units = 30)
Laboratory notebook: 5
Viva-Voce: 5

*Students will be introduced to this paper in first year. Students Shall be examined in the second year.

Text Books Recommended:

Das, B.M. & Deka,R 1992-93 Physical Anthropology Practical. Kitab Mahal Agencies, 104, Rabindra Sarani, Calcutta.

Sankalia, H.D. 1964 Stone age tools. Deccan College Post-Graduate and Research Institute, Poone.

Sarkar, S.S. 1957 A Laboratory Manual of Somatology. Scientific Book Agency, Calcutta.

Singh, I.P. & Bhasin,M.R. 1968 Anthropometry. Bharati Bhawan, New Delhi.

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PHYSICS

Paper-I (Theory)

GROUP A

Ma Marks 75

Unit I: Introduction, Physical World and Measurements
What is Physics: Scope and excitement; Physics in relation to Science: society and technology. Need for measurement, systems of units-SI: fundamental and derived units. Dimensional analysis: order of magnitude. Accuracy and errors in measurement.

Unit II : Description of Motion in one Dimension
Objects in motion, motion in one, two and three dimensions. Motion in a straight line, origin, unit and direction for time and position measurement. Uniform motion, its graphical representation and formulae, speed and velocity, relative velocity. Uniformly accelerated motion, its velocity-time graph, position-time graph, and formulae, General relation between position and velocity, application to uniformly accelerated motion, acceleration in general one dimensional motion.

Unit III: Description of Motion in Two and Three Dimensions
Vectors in two dimensions, general vectors, vectors and scalars, vector addition and multiplication by a real number, zero-vector and its properties. Resolution of a vector in a plane, rectangular components. Motion in two dimensions, cases of uniform velocity and uniform acceleration, general relation among position-velocity-acceleration for motion in a plane, uniform circular motion. Motion of objects in three dimensional space.

Unit IV : Laws of Motion
Force and inertia, first law of motion. Momentum, Second law of motion, impulse, some kinds of forces in nature. Third law of motion, conservation of

momentum, rocket propulsion. Equilibrium of concurrent forces. Static and kinetic friction, laws of friction, rolling friction, lubrication, Inertial and non-inertial frames.

Unit V : Work Energy and Power

Scalar product of vectors, work done by a constant force and by a variable force, unit of work, kinetic energy, power. Elastic collisions in one and two dimensions. Potential energy, gravitational potential energy and its conversion to kinetic energy, potential energy of a spring.

Different forms of energy, mass energy equivalence, conservation of energy.

GROUP B

Unit VI : Rotational Motion

Inter-dependence of Newton's laws of motion, centre of mass of a two particle system, momentum conservation and centre of mass motion. Centre of mass of a rigid body, general motion of a rigid body, nature of rotational motion, rotational motion of a single particle in two dimensions only, torque, angular momentum and its geometrical and physical meaning, conservation of angular momentum, examples of circular motion (car on a level circular road, car on a banked road, pendulum swinging in a vertical plane). Comparison of linear and rotational parameters, properties of moment of inertia-parallel axis and perpendicular axis theorem in two dimensions, examples of two dimensional rigid body motion (mass point on string wound on cylinder, cylinder rolling without slipping).

Unit VII : Gravitation

Acceleration due to gravity, one dimensional motion under gravity, two dimensional motion under gravity projectile motion. Universal law of gravitation, the gravitational constant, mass of the earth, inertial and gravitational mass, variations in the acceleration

due to gravity of the earth, geostationary satellites. Gravitational potential energy near the surface of earth, gravitational potential, escape velocity.

Unit VIII : Properties of Matter

Inter-atomic and inter-molecular forces, states of matter.

A. Solids; Crystalline and glassy solids. Hookes Law, Young's modulus, stress vs strain, bulk modulus, pure shear.

B. Fluids: Fluid pressure, Pascal's law, hydraulic lift, effect of gravity, atmospheric pressure, Buoyancy Archimedes' principle, Surface energy and surface tension, drops and bubbles, capillary rise, detergents and surface tension. Viscosity, sphere falling through a liquid, streamline flow, Reynold's number, Bernoulli's theorem. (without proof)

C. Gases: Boyle's law, Kinetic theory of gases, pressure, kinetic energy and temperature, absolute temperature, gas laws and Avogadro number.

GROUP C

Unit IX : Heat and Thermodynamics: Heat and its measurements Mechanical equivalent of heat, specific heat at constant volume and constant pressure of ideal gas, calorimeter. First law of thermodynamics. Thermodynamic state, equation of state, ideal & vander waal's gas, and isothermals, pressure-temperature phase diagram, Thermodynamic processes (reversible, irreversible, isothermal, adiabatic) heat-engines (Carnot cycle), second law of thermodynamics, efficiency of heat engines. Conduction, convection and radiation.

Unit X : Oscillations

Periodic motion, simple harmonic motion (S.H.M.), Oscillations due to a spring, kinetic energy and potential energy in S.H.M. simple pendulum. Forced oscillations, resonance and damped oscillations (Physical concepts only).

Unit XI : Waves

Wave motion, speed of wave motion, principle of super position, reflection of waves, standing waves and normal modes. Beats, Doppler Effect. Musical scale. Accoustics of building. (Basic concepts only)

PHYSICS

Paper II (Theory)

Max Marks: 75

GROUP A

Unit 1 : Electrostatics (S.I units only)

Frictional electricity, charges and their conservation, elementary unit, Coulomb's law, dielectric constant, electric field, electric field due to a point charge, dipole, di-pole field and dipoles' behaviour in a uniform(2 dimensional) electric field, flux, Gauss's law in simple geometries (Elementary idea). Conductors and insulators, presence of free charges and bound charges inside a conductor, Dielectrics (concept only), Capacitance (parallel plate), series and parallel, energy of a capacitor, high voltage generators, atmospheric electricity (Elementary idea).

Unit 2: Current Electricity

Introduction (flow of current), sources of e.m.f. (cells: simple, secondary, chargeable), electric current, resistance of different materials, temperature dependence, thermistor, specific resistivity, colour code for carbon resistances. Ohm's law, Kinchoff's law, resistances in series and parallel circuits, Wheatstone's bridge, measurement of voltages and currents, potentiometer.

Unit 3: Thermal and Chemical Effects of Current

Electric power, heating effects of currents, chemical effects and laws of electrolysis, simple concept of thermoelectricity, thermocouple.

Unit 4: Magnetic Effect of Current

Oersted's observation, Biot-Savart's law (magnetic field due to a current element), magnetic field due to a straight wire, circular loop and a solenoid. Force on a moving charge in a uniform magnetic field (Lorentz force), cyclotron (simple idea), forces and torques on currents in a magnetic field, forces between two currents, definition of ampere, moving coil galvanometer, ammeter and voltmeter.

GROUP B

Unit 5: Magnetism

Bar magnet (comparison with a solenoid), lines of force, torque on a bar magnet in a magnetic field, earth's magnetic field, tangent galvanometer, vibration magnetometer, para, dia and ferromagnetism(simple idea).

Unit 6: Electromagnetic Induction and Alternating Current: Induced e.m.f. Faraday's Law, Lenz's Law, induction, self and mutual inductance, alternating currents, impedence and reactance, power in a.c. circuit with L, C and R, series circuit, resonant circuit Phase diagram) and electrical machines and devices, ideal (transformer, generator, simple motors, choke and starter

Unit 7: Electromagnetic Waves (Qualitative Treatment)
Electromagnetic oscillations, some history of lectromagnetic waves (Maxwell, Hertz, Bose, Marconi). Electromagnetic spectrum (radio, microwaves, infra-red, optical, ultraviolet, X-rays, alpha, beta and gamma rays) including elementary facts about their uses and propagation, properties of the atmosphere w.r.t. various parts of electromagnetic spectrum

Unit 8: Wave Optics
Wave front and Huygen's principle, Interference-Young's double slit experiment, Diffraction-Polarisation-Polarisation of transverse waves. Applications related to these phenomena

Unit 9: Ray Optics and Optical Instruments
Ray Optics as a limiting case of wave optics. Reflection, refraction, total internal reflection, optical fibre, curved mirrors, lenses, mirror and lens formulae. Dispersion by a prism, spectrometer and spectra absorption and emission; scattering rainbow. Magnification and resolving power, telescope (Astronomical), microscope.

GROUP C

Unit 10: Electrons and Photon

Discovery of electron, e/m for an electron, electrical conduction in gases, particle nature of light, Einstein's photoelectric equation, photocells.

Unit 11: Atoms, Molecules and Nuclei

Rutherford model of the atom, Bohr model, energy quantization, hydrogen spectrum, composition of a nucleus, atomic masses, isotopes, size of nucleus, radio-activity. Mass energy relation, nuclear fission and fusion.

Unit 12: Solids and Semiconductor Devices

Crystal Structure - Unit cell: single, poly and liquid crystals (concepts only)
Energy bands in solids, conductors, insulators and semi-conductors, P-N Junction, Diodes, Junction Transistor, diode as rectifier, transistor as an amplifier.

Unit 13: Universe

The constituents of the universe; planets; elementary idea about determination of their distances and masses; stars; brightness, magnitude scale, luminosity, surface temperature; stellar spectra, energy source of stars (Concept only).

Text books

Physics
A textbook for Senior Secondary Classes, Vol I (Part I & Part II)
Vol II (Part I & Part II)
published by
National Council of Educational Research & Training, New Delhi.

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5:2:3(59)

PRACTICALS

Max Mark. 50

A. Fundamental Measurements:

1. To measure a short length by using Vernier Callipers and hence to determine (a) the volume of a cylinder (b) the volume of a sphere.
2. To use a screwgauge to measure the diameter and hence the area of cross section of a wire/rod.
3. To use a spherometer to measure the radius of curvature of a curved surface and the thickness of flat plate

B. General Properties and General Physics:

1. To measure an unknown weight by applying the principle of moments.
2. To determine the value of 'g' by a simple pendulum.
3. To read a Fortin barometer and hence to find the value of atmosphere pressure in bars.
4. To draw the $L\text{-}T^2$ graph of a simple pendulum and hence to determine the length of a second's pendulum.
5. To draw isotherm curve for air at room temperature by using a Boyle's law apparatus
6. Volume of irregular body by hydrostatic balance.
7. Sp. gravity of a liquid by sp. gr. bottle
8. Sp. gr. of a solid by Nicholson hydrometer

C. Heat:

1. To determine the water equivalent of a calorimeter
2. To determine the specific heat of a solid by the method of mixture
3. To determine the melting point of a solid by capillary tube method.

D. Light:

1. To determine position of the image of an object formed by a plain mirror and to verify the laws of reflection
2. To find the refractive index of the material of a glass slab by pin method
3. To measure the refracting angle of a prism and measure the refractive index of the material of prism by the method of ~~xxx~~ symmetrical emergence
4. To draw the I-D curve for a prism and hence calculate the refractive index of the material of prism (pin method).
5. To draw the U-V graph for a concave mirror and hence determine its focal length
6. To determine the focal length of a convex lens by the U-V method

E. Sound:

1. To determine the wavelength of sound by taking the first and second resonance positions

F. Magnetism and Electricity:

1. To determine the poles of a bar magnet and hence to measure the magnetic length
2. To draw lines of force of a bar magnet and to determine the neutral point on one side
3. To verify Ohm's law with an ammeter and voltmeter
4. To measure the reduction factor of a tangent galvanometer by using an ammeter and a rheostat
5. To determine an unknown resistance by a meter bridge
6. To compare the e.m.f's of the primary cells by using a potentiometer
7. To find the resistance of a fine wire and hence to determine the sp. resistance of the material
8. To study the laws of series and parallel resistances by ammeter and voltmeter

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REVISED P.U. GEOGRAPHY SYLLABI FOR ../SCIENCE.

(The students are required to answer three questions from Section-A and two question from Section - B).

PAPER - I PHYSICAL & HUMAN GEOGRAPHY FULL MARKS - 75.

Section - A Phusical Geography - (Total Marks - 45)

	Division of Marks	No. of Lectur
I. (a) Study of the Earth's crust	6	5
(b) Interior of the Earth		
II. Lithosphere		
(i) Study of Landforms	15	25
a) Primary Landforms		
b) Secondary Landforms		
c) Tertiary Landforms		
(ii) Rocks & Rock Weathering		
a) formation; characteristics and classification of Rocks.		
b) Types of weathering (mechanical and chemical)		
(iii)Denudational Processes		
a) Running Water (River)		
b) Glacier (valley and continental)		
c) Winds		
III.Atmosphere:	12	15
(i) Composition and Structure.		
(ii) Elements :		
a) Temperature :- Insolation, temperature zones		
b) Pressure belts.		
c) Kinds of winds and wind belts.		
d) Clouds:- formation and Types.		
e) Types of Precipitation.		
IV. Hydrosphere:	12	15
(i) Characteristics of Hydrosphere		
(ii) General Profile of the Ocean floor, (continental shelf, continental slope, deep sea plain and trenches).		
(iii)Movements of the Ocean.		
(a) Waves :- Formation and Types		
(b) Tides :- Formation and Types		
¢c) Currents :- Formation and Types.		
(iv) Ocean as a resource :- Mineral and Biological		

Section - B HUMAN GEOGRAPHY FULL MARKS 30.

	Division of Marks.	No.of Lectures.
I. Nature and Scope of Human Geography	3	2
II.Definition & Classification of Resources	3	2
III.Utilization of Natural Resources	12	24

i) Mineral & Energy Resources:
World Distribution & Production of
(a) Iron-Ore (b) Coal
(c) Petroleum (d) Bauxite

ii) Forest Resources and its Conservation

iii) Agricultural Resources.
(a) Classification of Agricultural Practices (b) World Distribution of Major Crops :
(i) Rice (ii) Wheat
(iii) Sugarcane (v) Tea

iv) Manufacturing Industries :
(a) Iron & Steel (b) Textiles

IV. Human Resources	8	8
i) World Population Distribution		
ii) World Population Growth - General Trends		
iii) Age and Sex Composition of World Population		
V. Settlements.	4	4
i) Introduction to Settlements and House-Types		
Total	75	100

Suggested Reading

(A) TEXT BOOKS

1. Physical Basis of Geography, NCERT
2. Certificate Physical and Human Geography by Goh Cheng Leong
3. Physical Geography by R.N. Tikka
4. Physical Geography by Phani Deka
5. Principles of Geography - Part II, NCERT

(B) REFERENCE BOOKS.

1. Physical Geography by P.Lake
2. Physical Geography by B.S.Negi
3. Principles of Geomorphology by P.Dayal
4. Principles of Climatology by S.Lal
5. Oceanography by R.C.Sharma
6. Physical Geography by E. Ahmad
7. Human Geography by Majid Hussain.

PAPER - II REGIONAL GEOGRAPHY (Total Marks-75 Division of Mark. No.of Lectures

(The students are required to answer one question from Section'A' two questions from Section-'B', and two questions from Section-C,.)

SECTION A: Concept of Region: 15 20

i) Definition of Region
ii) Types of Regions
iii) Major Natural Regions of the World.

a) Tropical Regions:
i) Equatorial
ii) Monsoon
iii) Hot Deserts.

b) Temperate Regions:
i) Mediterranean

c) Polar Regions:
i) Tundra

SECTION B: Geography of India: 40 45

i) Locational Setting
ii) Relief and Drainage
iii) Climate
iv) Soil and Natural Vegetation
v) Economy

a) Factors affecting Agriculture and distribution of the following Crops:

i) Rice
ii) Wheat
iii) Sugarcance
iv) Tea
v) Cotton

b) Mining: Distribution of

i) Coal
ii) Iron-Ore
iii) Bauxite
iv) Petroleum

c) Industries: Location and Distribution

i) Iron and Steel
ii) Cotton Textile

vi) Population:

a) Distribution and Density
b) Growth and Composition

vii) Regions of India and Study of Selected Meso Regions:

a) Mysore Plateau
b) Lower Ganga Plain
c) Thar Desert.

SECTION C: Geography of North East India: 20

i) Physical Setting:-

a) Relief & Drainage
b) Climate
c) Soil & Natural Vegetation.

ii) Economy:

a) Types of Agricultural Practices with special reference to shifting cultivation.

b) Industries:
i) Household & Traditional Industries (Weaving and Handicraft)
ii) Problems of Industrial development.
iii) Distribution and Growth of population since 1901.
iv) Problems of Transport and Communication. (Road and Railways).

c) Region of Account of the following:-
a) Meghalaya Plateau
b) Poorvanchal
c) Brahmaputra Valley.

Total	75	100

Suggested Readings.

a) TEXT - BOOKS.

1) Regional Geography of India by R.L.Singh
2) Economic and Regional Geography by P.Deka
3) India General Geography - NCERT. (Part-I and II)
4) Geography of India by Gopal Singh.
5) Geography of India by B.S.Negi.
6) Geography of the North-East by G.P.Bhakta.

b) REFERENCE BOOKS.

1) India and Pakistan by O.H.K. Spate & ATA Learmonth.
2) Economic and Commercial Geography by R.C.Sharma.
3) North-East:Land, People and Economy by R.Gopalakrishnan.
4) Economic Development of Assam by P.G.Goswami.
5) Agricultural Development in India by Surendra Singh.

PAPER - III PRACTICAL

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FULL MARKS - 50

	Division of Marks	No.of Practical (80)
I. a) Scale : (i) Plane (ii) Diagonal	10	2
b) Diagrams & Maps: (i) Diagrams:-		5
a) Line graph		
b) Bar graph		
c) Pie diagram		
(ii) Maps		
a) Drawing and Interpretation of Isopleth and Choropleth Maps.		
II. Representation of Major Relief Features	5	5
(i) Contours and Profiles		
a) Gentle Slope b)Steep Slope c)Convex Slope d) Concave Slope e) Conical Hills f) 'U' & 'V' shape valleys g) Water falls		
III. Weather Symbols and Conventional Symbols	10	5
a) Conventional Symbols & Topographical Map Reading		
b) Drawing of Temperature & Rainfall graphs		
c) Weather symbols and interpretation of Indian Weather charts.		
IV. Projections: Graphical Construction, Properties and uses of the following Projections:-	10	5
a) True Cylindrical Projection		
b) Conical with one standard parallel		
c) Zenithal Gnomonic Polar Projection.		
V. Introduction to Statistical Techniques in Geography :-	5	8
a) Classification of data & Preparation of Frequency table.		
b) Drawing of Histograms and frequency curve		
c) Measurement of Central tendencies.		
i) Mean (ii) Median (iii) Mode		
VI. Viva-Voce & Practical Note Book	10	-
Total	50	30

Suggested Readings.

1. Elements of Practical Geography by R.L. Singh.
2. Practical Geography by P. Deka
3. Maps and Diagrams by F.W. Monkhouse.
4. Fundamentals of Statistics Vol. 1 by G.Gupta and D.Gupta.

5 & 6 (39)

9. V. M. Sinha, Personnel Administration, Jaipur, R.B.S.A., Publishers, 1986.

10. V. Venkata Rao, Century of Tribal Politics in North East India, New Delhi, S. Chand, 1976.

ADDITIONAL READINGS

1. R.C. Agarwal, Comparative Study of the Indian Constitution and Administration, New Delhi, S. Chand (Latest).

2. R. B. Jain, (Ed.), District Administration, New Delhi, IIPA.

3. S. R. Maheshwari, State Government in India, New Delhi, Macmillan, 1979.

4. P. Sharan, Public Administration in India, Meerut, Meenakshi Prakashan.

5. K. K. Puri, Indian Administration, Jullunder, Bharat Prakashan.

6. R. N. Prasad, Government and Politics in Mizoram, Delhi, Northern Book Centre, 1987.

7. M. Horam, Naga Polity, Delhi, D.P. Publishers.

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UNIT 4 : Personnel Administration :

All India Services; Central Services; State Civil Services; their meaning, Recruitment/Structure and Role; Union Public Service Commission and State Public Service Commission; Their Composition and Functions.

Comptroller and Auditor General of India : His appointment and Role.

Election Commission : Its Composition and Functions.

UNIT 5 : Traditional Administrative Institutioms (Chiefships) in Meghalaya, Mizoram and Nagaland : Powers, Functions and Position.

District Council : Its Composition, Powers and Functions.

SUGGESTED READINGS

1. A. Avasthi, Central Administration, New Delhi, Tata McGraw Hill Publishing Company, 1980.
2. S. R. Maheshwari, Indian Administration, New Delhi, Orient Longman, 1984.
3. C. P. Bhambhri, Public Administration in India, New Delhi, Viskas, 1979.
4. D. P. Singh, Problems of Public Administration in India.
5. Elements of Indian Constitution, North Eastern Hill University, Shillong, 1985.
6. J. C. Johari, Indian Constitution and Administration, Delhi, Vishal Publications, 1982 or (Latest).
7. M. V. Pyles, Constitutional Government in India, New Delhi, S. Chand.
8. S. S. Khera, District Administration in India, Bombay.

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ELEMENTS OF INDIAN ADMINISTRATION

Maximum Marks : 100
Time : 3 Hours

PAPER - II

UNIT 1 : Development of Indian Administration During British Rule and Post-Independence period; Basic principles of Indian Administration under the Constitution of India; Socialist, Secular Republic, Federal System, Parliamentary Democracy, Role of Judiciary, Functions of Public Services.

UNIT 2 : Central Administration :

Political Executive : President; Powers, Functions and Role in Indian Administration; Relationship with Union Council of Ministers.

Prime Minister : Powers, Functions, Role and Position as Political Chief and the Real Executive; Relationship with Council of Ministers; Cabinet; Cabinet Secretariat; Cabinet Secretary; Relation between a Minister and the Secretary in India.

Secretariat : Its meaning; Organisation and Functions.

UNIT 3 : State Administration :

Political Executive : Governor - Powers and Functions - Legislative, Executive, Financial, Judicial, Discretionary and Position in State Administration; Relationship with Council of Ministers.

Chief Minister : Powers, Functions and Positions; Relationship with Council of Ministers.

State Secretariat : Its Organisation and Function.

Chief Secretary : His Role and Importance in State Administration.

District Administration : Deputy Commissioner (District Collector) ; His Role.

UNIT 5 : Delegated Legislation :

Meaning; Causes of growth of Delegated Legislation; Merits and Demerits of Delegated Legislation; Safeguards in Delegated Legislation.

Planning : Meaning; Kinds of Planning; Planning Process; Plan Formulation.

Public Relations; Meaning and Its importance in a democratic state; Elements of Public Relations; Obstacles to Public Relations; Public Relations Machinery in India.

SUGGESTED READINGS

1. A. Avesthi and S.R. Maheshwari, Public Administration, Agra Lakshmi Narain Agarwal, 1981.
2. M.P. Sharma, Theory and Practice of Public Administration, Allahabad, Kitab Mahal, (Latest Edition).
3. Vishnoo Bhagwan and Vidya Bhushan, Public Administration, New Delhi, S.Chand, 1981 or (Latest Edition).
4. C. P. Bhambhri, Public Administration, Meerut, Meenakshi Prakashan, (Latest Edition).
5. S.R. Nigam, Principles of Public Administration, Allahabad, Kitab Mahal (Latest Edition)
6. D.R. Sachadeva and Meena Sogani, Public Administration, Concepts and Applications.
7. A. Felix Nigro and G. Lloyd Nigro, Modern Public Administration, Fifth Edition (New York, Harper and Row, 1980).
8. J. H. Brebner, Public Relations and Publicity.

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SYLLABUS FOR PRE-UNIVERSITY (ARTS)
PUBLIC ADMINISTRATION

Maximum Marks : 100
Time : 3 Hours

PRINCIPLES OF PUBLIC ADMINISTRATION

PAPER - 1

UNIT 1 : Public Administration

Meaning, Nature and Scope of Public Administration; Public Administration as Science and Art; Importance of the study of Public Administration in the modern state; Relationship of Public Administration with other social sciences - Political Science, Economics, Sociology and Psychology.

UNIT 2 : Organisation :

Meaning; Principles of Organisation; Basis of Organisation; Hierarchy or Scalar process; Span of Control; Unity of Command; Concepts of staff and Line Agencies; Centralisation and Decentralisation; Headquarters and Field Agencies.

UNIT 3 : Personnel Administration :

Meaning; Merit System and Spoils System; Types of Personnel System.

Bureaucracy : Meaning; Characteristics; Role of Bureaucracy; Evils of Bureaucracy; Suggestions for improvements

Recruitment : Meaning; Methods of Recruitment; General Qualifications; Methods of Determining the qualifications of the Entrants to Public Service; Administrative Machinery for Determining qualifications.

Training : Meaning and Its adjective; Types of Training.

UNIT 4 : Financial Administration :

Budget Definition; Important Budgeting Principles; Types of Budget; Essentials of Budget System; Budgetary Procedures and Problems; Legislative Approval of the Budget.

Accounts : Meaning of Accounts; Essentials of Public Accounting; Kinds of Accounts.

Audit : Meaning of Audit and its objects; Types of Audit; Pre-audit and Post-audit; Functions of an Auditor.

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Proposed Chemistry Syllabus

For

Pre-University Science
NORTH EASTERN HILL UNIVERSITY

PAPER-I (Theory)

Total marks: 75
Time: 3 hrs

(Meant for P.U. I year)

Each paper will consist of three sections, namely Section-A, Section-B and Section-C. The number of lectures and marks per unit are given below:-

Unit No.	Title	No. of lectures	Marks
SECTION A			
1.	Atoms, Molecules and Chemical Calculations	11	7
2.	Atomic Structure	8	4
3.	Gaseous State	8	4
4.	Chemical Equilibrium	8	4
5.	Energetics	6	3
SECTION B			
6.	Periodic Table	7	4
7.	Bonding and Molecular Structure	9	5
8.	Redox Reactions	7	4
9.	Chemistry of Non-metals	17	9
10.	Chemistry of Lighter Metals	9	5
11.	Chemistry of Heavier Metals	12	7
SECTION C			
12.	Carbon and its Compounds	7	4
13.	Isomerism and Organic Reactions	7	4
14.	Purification and Characterisation of Organic Compounds	7	4
15.	Preparation and Properties of Hydrocarbons	12	7
	(TOTAL) =	135	75

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SYLLABUS IN CHEMISTRY FOR PRE-UNIVERSITY
NORTH-EASTERN HILL UNIVERSITY

FIRST PAPER

Theory

(The scope of the units corresponds to NCERT publications in Chemistry meant for Class XI and XII)

Section - A

Unit 1 : Atoms, Molecules and Chemical Calculations

Elementary concept of atoms and molecules; Atomic mass and mole concept; Chemical formulae and balancing of chemical equations, chemical calculations involving molar mass, percentage composition, empirical and molecular formulae, use of SI units, Concept of significant figures. Atomic weight, molecular weight, equivalent weight and their determination - Laws of Chemical Combination.

Unit 2 : Atomic Structure

Dalton's concept of atoms- defects of the model; modern idea of atoms - discovery of electron, proton and neutron. Rutherford's model of atom; Bohr's model of atom (elementary concept). Hydrogen spectrum. Concept of quantum numbers; electronic configuration of atoms upto atomic number 36 (using s, p, d and f system); Pauli's exclusion principle, Aufbau principle and Hund's rule.

Unit 3 : Gaseous State:

Boyle's law, Charles's law, combined gas laws, General Gas equation : PV = nRT; dimensions and values of R; Absolute Scale of temperature, Dalton's law of partial pressure, Graham's law of diffusion, Avogadro's hypothesis and its importance in chemistry, Difference between ideal and real gas; Basic postulates of Kinetic theory of gases. Numerical problems.

Unit 4 : Chemical Equilibrium

(a) Laws of mass action, criteria of chemical equilibrium, Le Chatelier's principle, effect of pressure, temperature and

concentration on the position of equilibrium, some industrial applications of the principle.

(b) Equilibria involving ions, ionisation of electrolytes, strong and weak electrolytes, acid-base equilibria, ionization of water (K_w); concept of pH, pK_w, pK_a and pK_b; elementary concept of solubility product and buffer solutions. Numerical Problems.

Unit 5 : Energetics

Energy Changes during a chemical reaction, internal energy and enthalpy, Hess's law of constant heat summation, explanatory terms - heat of reaction, heat of neutralisation, heat of formation, heat of combustion, heat of fusion and heat of vaporisation.

Section - B

Unait 6 : Periodic Table

General description of Mendeleeff's periodic table, advantages and disadvantages of the table, Modern Periodic table (long - form of the table) - based on s-block, p-block, d-block and f-block elements; Advantages of the long form of periodic table. Periodic trends in properties - ionization potential, atomic radii, ionic radii, electronegativity and electron affinity.

Unit 7 : Bonding and Molecular structures

Concept of ionic bonding, covalent bonding and co-ordinate covalent bonding; properties of each like of bonding; electronic structures of simple molecules like - NaCl, $CaCl_2$, Na_2O, $AlCl_3$, CaO, H_2O, CO_2, CH_4, CCl_4, HCl, HNO_3, H_2SO_4, H_3PO_4, NaOH, $Ca(OH)_2$, SO_2, SO_3, O_3, H_2O_2, Hydrogen bond. Basic concepts of Valence Bond Theory (VBT) and Molecular Orbital Theory (MOT). Elementary idea of hybridisation involving s and p-orbitals; hybridisation of Be, B and Carbon compounds. Shapes of the molecules and bond angles.

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Unit 8 : Redox Reactions

(a) Electronic concept of oxidation and reduction; Oxidant and reductant- redox reaction, oxidation number rules, balancing of following redox reactions by oxidation number method:

(i) $Sn^{+2} + Fe^{+3}$ —— (ii) $MnO_4^- + H^+ + C_2O_4^{2-}$ ——

(ii) $MnO_4^- + H^+ + Fe^{+2}$ —— (iv) $MnO_4^- + H^+ + Sn^{+2}$ ——

(v) $Cr_2O_7^{2-} + H^+ + Fe^{+2}$ —— (vi) $Cr_2O_7^{2-} + H^+ + I^-$ ——

(vii) $Cr_2O_7^{2-} + H^+ + Sn^{+2}$ —— (viii) $Cu + NO_3^- + H^+$ ——

(ix) $P + NO_3^- + H^+$ —— (x) $H_2O_2 + H^+ + KI$ ——

(b) Concept of electrochemical cell, Revercible electrods, E.M.F. of galvanic cells, Nernst's equation, standard electrode potentials, primary cell, fuel cell and corrosion.

Unit 9 : Chemistry of Non-metals

(a) Hydrogen, Oxygen and Nitrogen-

Hydrogen - position in the periodic table, isotopes of hydrogen, preparation, properties, reactions and uses.

Oxygen - preparation, properties and reactions, classification and uses of oxides.

Ozone - preparation, reactions and importance

Water - hard and soft water, removal of hardness- modern methods, Deionised water; Hydrogen peroxide - preparation, properties, structure and uses.

Nitrogen - preparation, properties, nitrogen cycle, fixation of nitrogen and uses; Ammonia - preparation, properties, and uses, Manufacture of ammonia by Haber's process; Oxides of nitrogen - preparation, properties; Nitric acid - its manufacture by Ostwald's method, reaction with metals, non-metals and uses. Aqua regia - preparation, properties and uses.

(b) Boron, silicon phosphorus, sulphur, halogens and noble gases.

Boron - borax and boric acid, analytical uses of borax.

Silicon - different allotropes, silica, glass, silicon carbide.

Phosphorus - preparation, properties of allotropes, oxides and oxy-acids of phosphorus, super phosphate of lime.

Sulphur - extraction by Frasch's process, different allotropes and their properties, preparation, properties and uses of SO_2, H_2S and sulphuric acid (manufacture by contact process).

Halogens - Preparation, properties and uses of halogens. Hydrogen halide - preparation, properties and uses; Noble gases - discovery and isolation, Argon - isolation from liquid air.

Unit 10 : Chemistry of Lighter Metals

Extraction of metals: General idea of metallurigical processes, concentration of ores, production of metals, purification of crude metals; Sodium - extraction, properties and uses - important compounds- NaCl, Na_2CO_3, $NaHCO_3$ and NaOH.

Magnesium and calcium - ores, extraction, properties and uses.

Important compounds - $MgSO_4$, CaO, $Ca(OH)_2$, plaster of paris and bleaching powder; Aluminium - Ores, extraction, properties and uses. Important compounds - $AlCl_3$ and potash alum.

Unit 11 : Chemistry of Heavier metals

Copper, Silver and Gold - Ores, extraction, properties and uses - Important compounds - $CuSO_4$, CuCl, $AgNO_3$, AgCl, $AuCl_3$

Ainc and Mercury - ores, extraction, properties and uses - important compounds - ZnO, $ZnSO_4$, HgS, Hg_2Cl and $HgCl_2$.

Tin and Lead - ores, extraction, properties and uses - important compounds - SnO_2, $SnCl_2$, white lead, sugar of lead and red lead.

Iron - ores, extraction, properties and uses - important compounds - $FeSO_4$, $FeCl_3$, Mohr's salt, potasium ferro and ferricyanide.

Manufacture of steel - Bessemer and open hearth process. Alloy steel.

Section - C

Unit 12 : Carbon and its Compounds

Elemental carbon. Carbon compounds. Inorganic compounds of carbon (CO, CO_2, CCl_4 and CaC_2 - preparation, properties and uses).

Organic compounds. Nomenclature of organic compounds; hydrocarbons, functional groups, some common organic compounds; alkanes, alkenes, alkynes, alcohols, aldehydes, ketones, halides, carboxylic acids, nitro compounds and amines. Homologous series.

Unit 13 : Isomerism and Organic reactions

Isomerism - Structural and stereo isomerism. cis-trans isomerism. Origin of chirality, optical rotation and racemic mixtures.
Organic reactions - addition, substitution, elimination, condensation and polymerisation.

Unit 14 : Purification and Characterisation of Organic Compounds

Purification - Crystallisation, sublimation, distillation, extraction and elementary idea of chromatography.

Quantitative analysis - detection of nitrogen, sulphur, phosphorus and halogens.

Determination of molecular weight by Victor - Meyer's method. Empirical formula, molecular formula - numerical problems.

Unit 15 : Preparation and Properties of Hydrocarbons

Source of hydrocarbons : Origin and composition of coal and petroleum; hydrocarbons from coal and petroleum, cracking and refining, octane numbers.

(i) General methods of preparation and properties of alkanes; Laboratory method of preparation of methane and reactions of methane with: (a) chlorine (b) air or oxygen (c) steam (d) heat.

(ii) General methods of preparation and properties of alkenes; laboratory preparation of ethylene and reactions of ethylene with: (a) hydrogen (b) chlorine (c) hydrogen bromide (d) sulphuric acid (e) oxygen (f) ozone (g) potassium permanganate and (h) reaction on heating to high temperature with acid catalyst.

(iii) General methods of preparation and properties of alkynes; laboratory preparation of acetylene and reactions of acetylene with: (a) hydrogen (b) chlorine (c) hydrogen bromide (d) dilute sulfuric acid in presence of mercuric sulphate catalyst (e) hydrogen cyanide (f) ozone (g) ammonical silver nitrate and (h) copper sulphate solutions.

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(iv) Benzene, toluene, resonance, Crum-Brown and Gibson's rule, Kornor's absolute method of orientation. Preparation and reactions of benzene involving (a) chlorination (b) nitration (c) sulphonation (d) reduction and (e) Friedel-Craft's reaction.

Books Recommended

1) Chemistry Class XI, Part I NCERT Publication, New Delhi

2) Chemistry Class XI, Part II

3) University General Chemistry - C.N.R. Rao, Mac Millan India Ltd., Delhi 1992.

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SECOND PAPER (Theory)

IInd Year P.U. Sc.

Total Marks - 75

Time - 3 Hours

The paper consists of three sections, namely Section-A, Section-B and Section-C. The number of lectures and marks per unit are given below:

Unit	Title	No. of lectures	Marks
Section - A			
1.	Solid state	8	4
2.	Solutions	11	7
3.	Thermodynamics	8	4
4.	Electrochemistry	8	4
5.	Chemical Kinetics	8	4
Section - B			
6.	Nuclear Chemistry and Radioactivity	9	5
7.	Chemistry of representative Elements	11	7
8.	Transition Metals, Including Lanthanides	8	4
9.	Co-ordination Chemistry and Organometallics	11	7
10.	Non-classical Co-ordination and compounds of special interest	9	5
Section - C			
11.	Organic Chemistry based on Functional Groups - I	9	5
12.	Organic Chemistry based on Functional Groups II	8	4
13.	Organic Chemistry based on Functional Groups - III	9	5
14.	Biomaterials	9	5
15	Compounds of Industrial Importance	9	5
	(Total)	135	75

Group B - Trigonometry (12 Marks)

Two to be attempted out of three questions, each carrying six marks.

1. Angles, in degrees and in radians. Trigonometrical ratios, special values at $0, \pi/6, \pi/4, \pi/3, \pi/2$.
   Circular functions; relations to trigonometrical ratios.
   Basic identities e.g. $\sin^2 x+\cos^2 x = 1$; $\sin(x+2\pi) = \sin x$ etc; $\sin(-x) = -\sin x$ etc; $\cos(\pi/2-x) = \sin x$ etc.

2. Trigonometrical identities involving sum and difference e.g. $\sin(x+y) = \sin x \cos y + \sin y \cos x$ etc.),
   transformation of sum and difference into product.
   (e.g. $\sin x + \sin y = 2\sin \frac{x+y}{2} \cos \frac{x-y}{2}$ etc.), multiple angles (e.g. $\sin 2x = 2\sin x \cos x$ etc.), submultiple angles.
   Graphs of the following trigonometrical funtions:

   $Y = \sin x$, $Y = \cos x$, $Y = \tan x$, $Y = a\sin x$, $Y = a \cos x$, $Y = a\sin bx$, $Y = a \cos bx$, $Y = a\sin(bx+c)$, $Y = a \cos(Bx+c)$.

3. Conditional identities involving angles of a triangle.
   Simple trigonometric equations of the form $\sin\theta = \sin\alpha$, $\cos\theta = \cos\alpha$, $\tan\theta = \tan\alpha$ etc.

Group C - 2D Co-ordinate Geometry (14 Marks)

Two to be attempted out of three questions each having two parts and carrying 7 marks.

1. Rectangular Cartesian coordinate system in a plane. Distance formula, section formula, Area of a triangle. Locus and its equation.
   Straight lines; equations in various forms; point-slope, Two-point; intercept, normal. General form of equation of a straight line. Angle between two lines; conditions for parallel/perpendicular lines. Concurrency of three lines. Distance of a point from a line. Co-ordinates of orthocentre and circumcentre of a triangle.

Contd.... 3/

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Annexur.

Proposed P.U. Mathematics syllabus

FIRST YEAR

PAPER I Total 75 Marks

Part I (objective - 37 Marks)

17 Marks for questions of the following types : Multiple choice, Fill in the blanks, True or False.

20 Marks for objective questions with 3/4 lines answer. Syllabus for part I is the same as in part II.

Part II (Descriptive - 38 Marks)

Group A - Algebra (12 Marks)

Two to be attempted out of Four questions, each having two parts and carrying 6 marks,

0. (This unit for objective only) : Basic ideas and working rules of the following : Indices, Surds, Variation, Ratio and proportion, Rule of Cross-Multiplication.

1. Sets; Subsets; Union, Intersection of sets (Finite number only). Difference of Sets, Complement. Venn diagram. Laws of set operations. Cartesian product of sets. Relations, Equivalence relation, ~~Partion~~ Partition. Functions : one-to-one, onto.

2. Complex numbers; addition, subtraction, multiplication, division, inverse, conjugation, absolute values, argument. Argand diagram; polar form. Powers and roots of complex numbers. Triangle Inequality; $|z_1 z_2| = |z_1| . |z_2|$.

3. Quadratic equations (with real coefficients); solutions. Relation between roots and coefficients; nature of roots. Formation of quadratic equation with given roots. Symmetric functions of roots (simple cases only).

4. Sequences; finite and infinite. A.P., G.P.; n^{th} terms, insertion of arithmetic/geometric means. Sum to n terms of A.P. and G.P. Sum to infinity of G.P. special finite Sums : $\sum n$, $\sum n^2$, $\sum n^3$.

Contd 2/

2. Equation of a circles; standard form, general form, parametric form. Points of intersection of a line and a circle with centre at the origin. Condition of tangeney. Tangent to a circle; equation, length.

3. Conic sections; Equations of conic sections (parabola, ellipse, hyperbola) in standard form. Conditions of tangenty for the line Y=mx + C.

4. (For objective half only): Polar co-ordinates in the plane-relations to Cartesian co-ordinate. Equation of a straight line/circle in polar co-ordinates.

Recommended Text Books :

1. Mathematics; A Text book for class XI, Part I
2. Mathematics, A Text book for class XI, Part II.
Both published by NCERT, Delhi. Revised edition (1994) to be prefer-ed.

SECOND YEAR

PART II : Total 75 Marks

Part I (Objective- 37 marks)

17 marks for questions of the following types : Multiple Choice, Fill in the blanks, True or False.

20 Marks for objective questions with 3/4 lines answers. Syllabus for part I is the same as in part II.

Part II (Descriptive - 38 Marks)

Group A - Calculus (28 Marks)

Four to be attempted out of Six questions to be set, each having two parts and carrying 7 marks.

Contd..... 4/

1. Concept of real-valued function on intervals in IR- domain, range; Graphs, Composition of functions. Elementary idea of limit. (rigorous definition to be avoided; geometric descrip description to be adopted).

meanings of $x \to a$, $x \to a^+$, $x \to a^-$, $\lim_{x \to a^+} f(x)$, $\lim_{x \to a^-} f(x)$, $\lim_{x \to a} f(x)$ etc.

Standard limits : $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1} (a > 0)$, $\lim_{x \to 0} \sin x = 0$

$\lim_{x \to 0} \cos x = 1$, $\lim_{x \to 0} \frac{\sin x}{x} = 1$, $\lim_{x \to 0} \frac{e^x - 1}{x} = 1$.

(proofs of only the last two limits to be discussed); Simple applications of these limits.

Continuity at a point, on an interval. (geometrical description to be preferred; discontinuities to be discussed through functions such as step functions and $y = x^2 - a^2/x - a$) Properties of continuity of polynomial, trigonometric, exponential, logarithmic and inverse trig. functions.

2. Derivative of a functions at a point; geometrical and physical significance. Evaluation of derivatives of x^n, trigonometric functions, exponential and logarithnic functions from first principles (simple cases only). Fundamental rules of differentiation, Chain rule. Derivatives of inverse trigonometric functions, implicit functions, functions in parametric form. Logarithmic differentiation. (Rules should be stated only, emphasis on application).

3. Application of the concept of derivatives; Motion in a straight line, motion under gravity; Rate of change of quantities. Increasing and decreasing functions, sign of the derivative. Maxima and minima (absolute and local). Curve sketching. Meaning of differential; errors and approximations.

4. Indefinite integral as antiderivative. Basic properties such as $\int [f(x) + g(x)] dx = \int f(x) dx + \int g(x) dx$, $\int c f(x) dx = c \int f(x) dx$ Fundamental rules of integration: integrals involving algebraic, trigonometric, exponential and logarithmic functions. Integrationby substitution, by using partial fractions. Integrals of the the type

Contd.....5.

$\int \frac{dx}{x^2 \pm a^2} dx$ etc. $\int \frac{dx}{\sqrt{x^2 - a^2}} dx$ etc.

$\int \frac{dx}{ax^2+bx+c}$ etc. $\int \frac{px+q}{ax^2+bx+c} dx$ etc.

$\int \frac{dx}{\sqrt{ax^2+bx+c}}$ etc. $\int \frac{px+q}{\sqrt{ax^2+bx+c}}$ etc.

Integration by parts. Integrals of the type

$$\int \frac{dx}{a+b\sin x}, \int \frac{dx}{a+b\cos x}, \int \sin^n x \cos^m x \, dx$$

5. Definition of definite integral as a limit of sum illustrated with the hepp of simple examples. Fundamental theorem of calculus. Evaluation of definite integrals with the help of this theorem (Simple properties such as

$$\int_a^b f(x)dx = -\int_b^a f(x)dx, \quad \int_a^b f(x)dx = \int_a^c f(x)dx + \int_c^b f(x)dx \text{ etc.}$$

Definite integral and area bounded by a curve between two ordinates and x-axis.

6. Differential equations; order and degree. Formation of a differential equation. General and particular solutions of a diff. equation. Solution of a diff. equation by the method of separation of variables.

Contd.....6.

7. (For objective half only). Properties of definite integral such as

$$\int_0^{2a} f(x)dx = \int_0^a f(x)dx + \int_0^a f(2a-x)dx \;,\quad \int_0^a f(x)dx = \int_0^a f(a-x)dx$$

$$\int_{-a}^{a} f(x)dx = 2\int_0^a f(x)dx \qquad \text{if f is an even function}$$

$$= 0 \qquad \text{if f is an odd function.}$$

Group B : Vectors (10 Marks)

One to be attempted out of two questions to be set : each having three parts and carrying 10 marks.

Vectors as directed line segment; magnitude and direction of a vector. Equal vectors, zero vector, Position vector of a point. Component of a vector. Addition, scalar multiplication of vector. Position vector of the point dividing a given straight line in a given ratio. Decomposition of a vector into three non-coplanar directions; $\bar{i}, \bar{j}, \bar{k}$ as base vectors. Direction Ratios and direction cosines for any vector. Angle between two vectors whose d.c. are given. Scalar (dot) Product. Cross Product. Scalar triple Product.

2. Applications of vectors : Law of parallelogram of forces; current forces, equilibrium of forces. Parallel forces. Moment of a force about a point. Moment of a couple about a point. Work done equals force into displacement. Proof of cosine rule, angle in a semicircle is a right angle. Area of a tringle and of a parallelogram. Proof of sine rule. Volumes of parallelopiped. Coplanarity of vectors using scalar triple product.

Contd.....7.

Recommended Text Books:

1. Mathematics; A text book for class XII Part I
2. Mathematics; A text book for class XII Part II
   Published by NCERT. Revised edition (1994) to be preferred.

SECOND YEAR

PAPER III (50 Marks)

Part I : (Objective : 25 marks)
10 marks for questions of the following type: Multiple Choice, Fill in the blank, True of false. 15 marks for Questions involving 3-4 lines answers.
Syllabus is the same as in Part II.
Part II: (Descriptive : 25 marks)

Group A : Algebra (18 marks)

3 questions to be attempted out of five to be set each carrying six marks.

1. Permutation and Combination : Fundamental Principle of counting. Meaning of factorial. Permutation as arrangement. ${}^{n}P_{r}$ and ${}^{n}C_{r}$. Simple applications including circular permutations.

2. Binomial Theorem : Principle of mathematical induction and simple applications. Proof of the Binomial Theorem with positive integral exponent. General and particular term.. Binomial theorem for any index (without proof). Application in approximation.

Contd.....8.

3. Matrices and determinants* : Matrix as rectangular array of numbers. Different types of matrices. Equality of matrices, Addition, scalar multiplication & multiplication of matiices. Linear combination of matrices. Non-commutativity and associativity of matrix multiplication. Singular and non-singular matrices. Linear equation in matrix notation. Determinants; minor and co-factor. Expansion of a determinant. Properties and elementary transformations of determinants. Application of determinants in solution of equations and area of a triangle. Cramer's Rule. Adjoint and inverse of a matrix; properties. Application of matrices in solving simultaneous equations in three variables.

*(Treatment in general should be limited to matrices and determinants upto order 3 only).

Group B : Trigonometry (7 marks)

One question to be attempted out of two to be set.

1. Sine formula, cosine formula (in triangle): related formulas. (e.g. area of a triangle equals $\sqrt{s(s-a)(s-b)(s-c)}$

Simple problems on solution of triangles. Height and distance.

2. Inverse of a function. Inverse trigonometric functions. Principal branches of inverse trigonometric functions; Graphs of the principal branches. Properties of inverse trigonometric functions such as

(i) $\sin^{-1}(\sin x) = x$ etc. (ii) $\sin^{-1}(1/x) = \operatorname{cosec}^{-1} x$ etc.

(iii) $\sin^{-1}(-x) = -\sin^{-1} x$ etc.

(iv) $\sin^{-1} x + \cos^{-1} x = \pi/2$ etc.

(v) $\tan^{-1} x \pm \tan^{-1} y = \tan^{-1} \dfrac{x \pm y}{1 \mp xy}$

(vi) $2\tan^{-1} x = \sin^{-1}(2x/(1 - x^2))$ etc.

Representation of the inverse trigonometric functions in the simplest form like

$$\tan^{-1}\left(\frac{x}{\sqrt{a^2 - x^2}}\right) = \sin^{-1}(x/a) \quad \text{etc.}$$

Contd·····9/-

4:1 (60)

Recommended Text Books:

For Group A, (1) Mathematics; A Text Book for Class XI Part I.
(2) Mathematics; A Text Book for class XII Part I

For Group B, Mathematics; A text book for class XI, Part II.
All these published by NCERT. Revised edition (1994) to be preferred.

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EDUCATION PAPER - I

Introduction to the Study of Education

Max. Marks - 100. Time:3 hours.

UNIT I

	Lectures
1. Concept of Education	10
- Meaning of Education and literacy; distinction between them.	
- Formal, informal and nonformal education; their characteristics.	
- Stages of Education-Pre-primary, primary, secondary and higher education- meaning and objectives.	
2. Constitutional Provisions relating to Education	10
- Free and compulsory Education	
- Religious instruction	
- Language safeguards	
- Equality of opportunity	
- Education of minorities	
- Education of weaker sections and scheduled castes	
--Education of Anglo Indian Community	
- Instruction in mother tongue	
- Development of Hindi	
- Education in the Union territories	
- Higher education and research	
- Educational and cultural relations with foreign countries.	
3. Education and National objectives	8
- A detailed study of chapter I of the Report of the Education Commission (1964 - 66)	
- Main provisions in the National Policy on Education (NPC) 1986.	

UNIT II

4. Aims of Education	4
- Individual development	
- Social development.	
5. Curriculum	8
- Meaning of Curriculum	
--Types of Curriculum, Child -centred and subject centred	
- Principles of curriculum construction	
- Co-curricular activities in Curriculum	

Contd..... 2/-

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UNIT III

6. Educational Ideas of Western Educators 12

- Pestolozzi
- Frobel
- Montessori
- Rousseau

7. Educational Ideas of Indian Educators 12

- Gandhijii
- Tagore
- Vivekanda
- Radhakrishnan

UNIT IV

8. Population Education 8

- Population situation in India
- Educational problems due to over-population :

  Wastage and stagnation; Lack of infrastructural facilities : Quality of Education
- Definition of Population education
- Scope of population education

9. Adult Education in India 8

- Meaning and Scope of Adult Education
- National Adult Education programme its objectives
- Methods and aids for the promotion of Adult Literacy.
- National Literacy Mission

Lectures - 80
Tutorials - 10
Total - 90

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Books Recommended for students

1. Taneja/V.R. : Educational Thought and Practice.
2. Kar B.C : Education : A study of its General Principles Gauhati New Book Stall.
3. Lakshmi S. : Innovations in Education : Sterling Publishers Pvt.Ltd. New Delhi

Books Suggested for Reference

1. Aggarwal J.C. : Theory and Principles of Education Vikas Publishing Delhi.
2. Safaya and Shaida. : Educational Theory & Practice Dhanpatrai & Sons, Delhi.
3. Raymont T. : Principles of Education
4. Mukherjee K.K. : Great Educators, Das Gupta & Co., Calcutta.
5. Siqueira T.N. : Modern Indian Education, Oxford University Press. London 1967.
6. Tibble J.W (Ed): An Introducation to the study of Education, London Routledge,
7. NCERT : Documents on Social, Moral and Spiritual values in Education. NCERT, New Delhi
8. NCERT : Education in Social context. NCERT, New Delhi
9. Rastogi : Non-formal Education, Concept, Nature and Scope and a Model for NFE Models, NCERT, New Delhi
10. Ross J.J. : Groundwork of Educational Theory. Calcutta Oxford 1972.
11. Vyas R. N. : Educational, Human Society, Ajanta Publication Delhi.
12. Shukla P.D. : Towards the new Pattern of Education in India, Sterling Publishers, New Delhi
13. Nunn P C : Education : Its Data & First Principles. London Edward Arnold 1970.
14. Seetha Ramu ; Philosophies of Education New Delhi : Ashish, 1978.
15. Report of the Education Commission (1964 -66) NCERT, New Delhi (Chapter I)
16. National Policy on Education, 1986.

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EDUCATION PAPER - II

EDUCATIONAL PSYCHOLOGY

Max.Marks-100. Time:3 Hours.

Lectures

UNIT I PSYCHOLOGY AND EDUCATION I 8

A. 1. Psychology as a science of behaviour
- Meaning and scope of educational psychology
- Relationship between psychology and education
- Importance of psychology for teachers in promoting effective learning.

B. 2. Growth and Development 12
- Concept of growth and development
- Psysical, intellectual, emotional and social development from infancy to adolescence and their educational implications.
- Role of heredity and environment in growth and development of an individual

UNIT II Learning and Habit Formation 15

3. Learning
- Nature and meaning of learning
- Process of learning- trial and error, imitation, conditioning and insight learning
- Laws of learning-law of readiness, law of effect and law of exercise
- Factors affecting learning
- Transfer of learning
- Individual differnces in learning and implications for teaching

4. Habits their formation and dissolution 15

5. Attention-Characteristics
- Types of attention
- Attention and interest-educational implications

6. Memory-registration, retention, recognition and recall
- Factors affecting memory
- Aids for facilitating memory

A:1(65)

UNIT III Intelligence 10

7. Intelligence

- Meaning and nature
- Concept of I.Q.
- Individual differences - gifted and backward and their education
- Intelligence and creativity

UNIT IV Personality, Mental Health and Adjustment 10

8. Personality

- Meaning, nature and concept of personality
- Types and traits of Personality
- Factors affecting personality development

9. Basic Needs 10

- Biological, social and emotional needs
- Educational significance of needs

10. Mental Hyggiene and Mental Health

- Maladjustment - contributory factors
- Adjustment mechanism
- Deviant behaviour - drub abuse and their effects
- A preventive measures and rehabilitation

UNIT V Testing,and Evaluation in Education 20

11. Testing, Measuremrnt and Evaluation

- Measning of measurement, testing and evaluation
- Measurement of intelligence
- Intelligence tests
- their types, uses and applications
- Assessment of personality - types of tools and their uses.

12. Educational evaluation

- Meaning and concept
- Types of exaination - essay type, short answer type and objective type questions, their relative merits and demerits

LECTURES - 100
TUTORIAL - 10

TOTAL - 110

4:1(6)

Books Recommended for Students.

1. Kakkar I B : Educational Psychology
Prentice Hall of India, New Delhi 1993

2. Mangal S.K. : Psychological Foundations of Education,
Prakash Brothers, Ludhiana..

3. Bhatia,H.R. : Elements of Educational Psychology New Delhi
Oxford and IBH Pub.Co, 1982.

Books suggested for Reference

1. Jaiswal S : Foundations of Educational Psychology
Arnold-Heinemann Publishers. New Delhi

2. Saikia S : A Text - Books of Education for Beginners,
Mani Manik Prakash, Gauhati.

3 Dandekar W : Psychological Foundations of Education,
Macmillan and Co.

4. Chauhan : Advanced Educational Psychology
New Delhi Vikas Publishing Co.

5. Ebel E.L. : Essentials of Educational Measurement
New Delhi : Prentice Hall of India.

6. Harper & Harper : Preparing objective type examinations :
A Handbook for Teachers, Students & Examiners : New Delhi Prentice Hall,1990.

7. Mangal S.K. : Advanced Educational Psychology,
New Delhi Prentice Hall of India.

8 Narayan Rao S : Educational Psychology :
Wiley Eastern, 1990 New Delhi-110002

9.. Rastogi : Educational Psychology
Sterling New Delhi

10. Skinner,C.E: Essential of Educational Psychology,
New Delhi Prentice Hall 1988.

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EDUCATION

PAPER II

EDUCATIONAL PSYCHOLOGY

Max Marks 100 Time : 3 Hours

Objective

(i) To acquaint the students with the knowledge of psychology and its application to the field of education

(ii) To introduce to students the major psychological concepts such as learning, intelligence, personality and their educational significance.

(iii) To appraise the students with the concepts of educational testing and evaluation

UNIT I

		Lectures
1.	Psychology and Education	8
-	Psychology as a science of behaviour	
-	Meaning and scope of educational psychology	
-	Relationship between psychology and education	
-	Importance of psychology for teachers in promoting effective learning	

UNIT II

2.	Growth and Development	20
-	concepts of growth and development	
-	physical, intellectual, emotional and social development from infancy to adolescence and their educational implications.	
-	Role of heredity and environment in growth and development of an individual	

UNIT III

3.	Learning	20
-	Nature and meaning of learning	
-	Process of learning-trial and error, imitation, conditioning and insight learning	
-	Laws of learning-law of readiness, law of effect and law of exercise	
-	Factors affecting learning	
-	Transfer of learning	
-	Individual differences in learning and implications for teaching	

UNIT IV

4.	- Habits-their formation and dissolution	5
5.	- Attention - Characteristics - Types of attention - Attention and interest-educational implications	10
6.	- Memory-registration, retention, recognition and recall	10
	- Factors affecting memory	
	- Aids for facilitating memory	

UNIT V

7. Intelligence 15
   - Meaning and nature
   - Concept of I.Q.
   - Individual differences - gifted and backward and their education
   - Intelligence and creativity

UNIT VI

6. Personality 15
   - Meaning, nature and concept of personality
   - Types and traits of personality
   - Factors affecting personality development

UNIT VII

9. Basic needs - biological, social and emotional needs 10
   - Educational significance of needs

10 -Mental Hygiene and Mental Health 15
   - Maladjustment - contributory factors
   - Adjustment mechanism
   - Deviant behaviour - drub abuse and their effects preventive measures and rehabilitation

UNIT VIII

11. Testing and Evaluation in Education 20
   - Meaning of measurement, testing and evaluation
   - Measurement of intelligence; intelligence tests their types, uses and applications
   - Assessment of personality - types of tools and their uses.

12. Educational evaluation; meaning and concept 12
   - Types of examinations- essay type, short answer type and objective type questions, their relative merits and demerits

LECTURES	-	160
TURORIALS	-	20
TOTAL	-	180

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Books Recommended

A. For Students

1. Bhatia, H.R. : Elements of Educational Psychology, Oxford & IBH Publishing-Co.,1982

2. Bhatia, H. R. : General Psychology, Oxford & IBH Publishing Co.,1976.

3. Jaiswal, S. : Foundations of educational Psychology Arnold-Heinemann Publishers.

4. Mangal, S.K. : Psychological Foundations of Education, Pradash Brothers, Ludhiana.

5. Saikia, S. : A Text Book of Education for Beginners, Mani Manik Prakash, Gauhati.

6. Dandekar, W. : Psychological Foundations of Education, Macmillan & Co.

B. For Teachers

1. Atkinson and Atkinson : Geneal Psychology New Delhi Prentice Hall.

2. Chauhan, : Advanced Educational Psychology New Delhi Vikas Publishing Co.

3. Ebel, E.L. : Essentials of Educationsl Measurement New Delhi : Prentice Hall of India.

4. Harper & Harper Preparing objective type examinations : A Handbook for Teachers, students and Examiners : New Delhi Prentice Hall, 1990

5. Mangal, S.K. Advanced Educational Psychology, New Delhi Prentice Hall

6. Narayan Rao, S. Educational Psychology New Delhi : Wiley Eastern, 1990.

7. Kakkar, I.B. : Educational Psychology New Delhi Prentice Hall.

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Revised Syllabus for Pre-University

Sanskrit

New Course

Paper - I

1. Prose and Grammar

Prose

1. Harsa Divakarasamvada
2. Karnabharam
3. Naganandam
4. Vasavadatta

Objectives from these books only with General Textual Questions. 50

2. Grammar 50

1. Declension
2. Conjugation
3. Krit Pratayas (Potential participles) (only important examples may be set for examination)
4. Correction & Translation (Eng to Sanskrit)

Paper - II

Poetry Section

Objectives and Descriptives 50 + 50 = 100

1. Raghuvamsa - II
2. Gita - II
3. Bhattikaryam - Canto - II

(Descriptives - Questions, Translation and Explanation) Marks - 50

Objectives from the Texts - Marks - 50

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SYLLABUS FOR PRE-UNIVERSITY LATIN COURSE

PART I: 80 MARKS

Latin Prose text translation & questions on text	30 marks
Grammatical Questions	50 marks

(Suggested Prose text: Cicero - De Senectute)

(Grammar Themes to be known:

The verb "Esse" and its compounds

The Passive Verbs of 1st, 2nd, 3rd, 4th Conjugations

Cum Clauses

Direct and Indirect Questions; Alternate questions;

Pronouns : Personal, Reflexive, Demonstrative, Relative Correlative

Adjectives : Definitive and Intensive, Pronominal Numeral,

Mixed Conjugations of verbs

Accusative and Infinitive

Gerund and Gerundive

Deponent Verbs

Irregular verbs: Possum; volo, nolo, malo; fero, eo, fio

Various uses of Accusative, Ablative (including Ablative Absolute); Dative; Genitive, locative

Impersonal verbs

COMPLEX SENTENCES in Latin:

Clauses: of purpose, of consequence, of time, conditional clauses, of concession, cause, comparison, relative clauses clauses introduced by Quominus & Quin

Reported Speech

(Recommended Text: Longman's Latin course I, II A. Jean S.J.,)

PART II 120 MARKS

Translation of Latin Prose & Poetry Texts	40 marks
& Textual questions	10 marks
History of Latin Literature	30 marks
Translation Latin into English	20 marks
Translation English into Latin	20 marks

(Suggested Prose Text: Cicero, In Catilinam

Suggested Poetry Text: Virgil Aeneid Bk. V)

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BIOLOGY

PAPER I

Part A : Botany

Unit - 1, Plant Diversity

Enormous variety of living things, the need for classification; The basic features of classification; Concept of species-taxon and categories; Hierarchial levels of classification, bionomial nomenclature, basic principles of classifications : natural and phylogenetic; General account of bacteria, viruses and cynobacteria.

Algae - complex autothrophs, red, brown and green algae, life cycle of green algae - Ulothrix; Economic importance of algae.

Fungi - General account of Zygomycetes, Ascomycetes and Basidiomycetes, Life cycle of fungi - Mucor; Economic importance of fungi; General account of lichen and mycorrhiza, Bryophytes, ferns and gymnosperms - General characteristics and life histories of a moss and a fern; General characteristics of gymnosperms.

Angiosperms - Study of the common plants of the following families ; Cruciferae, Malvaceae, Papilionaceae and liliaceae.

Unit - 2, Plant Morphology

Morphology and function of root, stem, leaf and their modifications; Reproduction and development in angiosperms : asexual and sexual; Structure and function of flower; Infloresence; Development of male and female gametophytes, (monosporic type only); Pollination and fertilization; Development of endosperm, seed and fruit; Seed dispersal.

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Paper II

Part A : Botany

Unit - 1, Plant Anatomy

Tissue system in the flowering plants : meristemetic and permanent (simple, complex, secretary) tissues; Primary anatomical structures of root, stem (dicot and monocot) and leaf (dorsiventral and isobilateral).

Unit - 2, Plant Physiology

Water relations : water relations of plant cell, water potential, absorption and transport in plants, root pressure, ascent of sap, transpiration, stomata - development, structure and types; Plant nutrition - essential elements, criteria of essentiality, passive and active uptake of minerals; Photosynthesis : Photosynthetic electron transport, photophosphorylation, calvin cycle; Plant growth, hormones and growth regulators; Agricultural uses of synthetic growth regulators, senescence and abscission; Plant movement.

Unit - 3, Ecology

Basic concepts of population, community and ecosystem; Biotic community, interactions between different species; Community development - succession in aquatic habitat; Ecosystem - major components and interactions; Conservation of natural resources : renewable and non-renewable (brief account); Wild life and forest conservation, concept of endangered species - Indian examples; Environmental pollution : air & water pollution sources, their effects and methods of control; Environmental issues - Global warming and ozone depletion.

4/B/1(74)

Biology Syllabus

Paper - I

Part B : Zoology :

Unit 1 : General Zoology

1. Outline classification of animal kingdom (Five kingdom concept) upto classes with salient features and examples (Protozoa should be considered as a sub-kingdom and classification only upto phyla).
2. Differentes between chordata and non-chordata.
3. Introduction to different types of animal tissues.

Unit 2 : Functional anatomy

Non-chordata

1. Amoeba : Structure & Reproduction.
2. Hydra : Morphology, Body wall and Reproduction.
3. Earth-worm : External morphology; digestive, excretory, reproductive and nervous system.
4. Cockroach : External morphology; digestive and reproductive system.

Chordata

1. Study of Frog/Toad : Morphology and anatomy (Digestive, respiratory, circulatory, excretory, urinogenital and nervous system)
2. Comparative accounts of heart, brain and digestive system of Frog/Toad and Rabbit/ Guinea pig.

Unit 3 : Applied Zoology

1. Parasitic Protozoan (E. histolytica, Plasmodium, Giardia, Leishmania and Trypanosoma): hosts and pathogenecity.
2. Ascaris : Life cycle and pathogenecity.
3. Concepts of Sericulture, Apiculture & Pisciculture.

4·1(75)

Paper - II

Part B : Zoology

Unit 1 : Cell Biology, Genetics and Evolution

Cell Biology :

1. Ultra-structure of anumal cell & plant cell, and major functions of different organelles; Morphology of chromosome; Metacentric, sub-metacentric, acrocentric and telocentric chromosomes.
2. Cell Division : Amitosis, mitosis & meiosis.

Genetics

1. Mendelian Principles of inheritance with examples.
2. Linkage, Crossing-over and gene interaction : comb character inheritance in fowl as an example.
3) Basic concept of cytoplasmic inheritance and mutation.
4) Introduction to Genetic disorders : Down's syndrome and Hemophilia.

Evolution and Distribution of animals :

1. Concept of organic evolution with evidences (anatomical and embryological).
2. Dawwinism and Neo-Darwinism.
3. Geological era and dominant fauna of each era.
4. Zoogeography.

Unit 2 : Biochemistry, Physiology and Endocrinology

Biochemistry

1. Basic concepts of carbohydrates, proteins, fats and enzymes.
2. Structure of nucleic acid (DNA & RNA).
3. Definitions of replication, transcription, genetic code and translation.

4:1(76)

Physiology

1. Physiology of digestion and excretion in mammals.
2. Blood : Composition and functions.
3. Respiration : Anaerobic and aerobic respiration; Outlines of glycolysis and Krebs cycle (TCA cycle).
4. Structure and function of mammalian eye.

Endocrinology

1. Difference between endogrine and exocrine glands; Definition of Hormone.
2. Major endocrine glands (Pituitary, thyroid, adrenal, pancreas, testis and ovary); their hormones and functions.

Unit 3 : Developmental Biology

1. Basic concepts of gametogenesis and fertilization.
2. Cleavage and gastrulation in frog/toad.

PRACTICAL (4.7(77))

Biology Paper I and II

Part B (Zoology)

Full Marks : 25
Time : 90 Minutes

1. Dissection :

Earthworm : External morphology, Digestive and Nervous system; mounting of the nerve ring.

Cockroach : External morphology, digestive system and mouth parts.

Toad/Frog : External morphology: digestive, arterial and urinogenital systems; brain and spinal nerves.

2. Identification :

Non-chordata

Protozoa : Amoeba, Euglena, Paramecium.
Porifera : Sycon
Coelenterata Hydra, Aurelia, Physelia, Coral fungia.
Helminths : Male and female ascaria, Taenia.
Annelids : Leach, Nereis.
Arthropoda : Prawn, Scolopendra, Julas, a moth, a butterfly, Praying mantis, Stick insect, Scorpion, Limulus.
Mollusca : Pila, Unio, Octopus.
Echinodermata : Star fish, Sea urchin.

Protochardata: Amphioxus.

Chordata :
Pieces : Shark, Ray, Heteropneustes, Clarias, Anabas, Labeo, Channa, Exocoetus.
Ampbibia : Hyla, Salamander.

Reptilia : Calotes, Chameleon, Naja, Hydrophys, Viper, a non-poisonous snake.

Aves : Mynah, Sparrow, King fisher.

Mammalia : Microchiroptera, Megachiroptera, Scaly anteater.

Histological, Cytological and Embryological slides :

T.S. Stomach, small intestine, liver, pancreas, lung, kidney, testis, ovary, thyroid (only mammals); T.S. & L.S. Hydra; T.S. Ascaris (male & female); T.S. Earthworm (Typhlosolar region); Slides of amphibian and mammalian blood.

Stages of Mitosis; Cleavage and Blastula in amphibians.

Bones : Endoskeleton (skull, vertebrae, girdles, limb bones of toad/frog and guinea pig/rabbit.

3. Preparations:

Temporary stained preparation: Ctenoid and cycloid scales; Smear preparation of mammalian blood; striated muscle.

4. Practical Record.

Distribution of Marks.

Dissection = 7 Marks

Identification= 10 Marks

Preparation = 3 Marks

Record & Viva= 5 Marks

PRACTICAL

BIOLOGY PAPER I & II (4:1(79)

PART A (BOTANY)

List of Botany experiments :

1. Study of simple and compound microscopes
2. Study of plant diversity with suitable examples
3. Study of different types of modifications of root, stem and leaf.
4. Study of different types inflorescences and floral parts.
5. Study of floral characters of cruciferae, malvaceae, Papilionaceae and liliaceae families
6. Anatomical study of typical monocat and dicot stem and root.
7. Demonstration of osmosis, transpiration and photosynthesis.
8. Field study of aquatic (pond) and terrestrial (Forest, grassland) ecosystems.

Distribution of Marks Part A (Botany)

Full Marks:25

Time :90 minutes

Systematic study of flower	-	4 marks
Anatomical study of stem and root	-	4 marks
Comments on Physiological experiments	-	4 marks
Identification and comments on the spots related to plant diversity and ecology portion	-	8 marks

Books Recommended

1. A Text Book of Zoology : R. D. Vidyarthi, Publishers- Agrasia Publishers, Deresi-2 Agra-4.
2. A Text Book of Biology : D. Mukherji & H.C. Mukherji Publishers, New Book Stall 5/1 Ramanath Majumdar street Calcutta - 700009.
3. A Text Book of Biology : D.C. Kumdu, & Guha, Publishers, Ashoka Pustakalaya, 64 Mahatma Gandhi Rd, Calcutta-700009.
4. Outlines of Biology : K.S. Das & J.B. Mukherji, Publishers, the Central Book Agency. 14 Nankim Chatterjee Street Calcutta-700009.
5. General Zoology : Sterer and Usinger Publishers McGraw Hill Book Company, New York.

4:1(50)

6. A Text Book of Biology : Prasad, S.N.K.S. Bilgrami and L.M. Srivastava, Publishers, Vikas Publishing House, PVT., Ltd. 5 Ansari Rd., N. Delhi -110002.

7. A class Book of Botany : Dutta A. C. Publishers Oxford University Press.

8. Biology I & II : N.C.E.R.T., Publication, New Delhi.
A Text Book for Class XI & XII

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LOGIC

PAPER : I

Maximum Marks : 100 Time : 3 hours

Marks : 20
No. of Lectures: 15

1. The nature of argument and its appraisal.
2. Truth and Validity.
3. Logic as the science of argument.
4. Words and Terms.
5. Words: Categorematic, Syncategorematic and Categorematic.
6. Terms: Simple and Composite.
7. Singular and General.
8. Collective and Non-Collective.
9. Concrete and Abstract.
10. Positive, Negative and Privative.
11. Absolute and Relative.
12. Connotative and Non-connotative.
13. Meaning, Sense, Intention and Connotation.
14. Reference, Extension and Denotation.
15. Inverse variation of Connotation and Denotation.
16. Distinction between Sentence and Proposition.
17. Constituents of Proposition.
18. Subject, Predicate and Copula.

II. Types of Proposition:

Marks : 12
No. of lectures: 15

1. Simple and Compound.
2. Singular and General.
3. Verbal and Real.
4. Classification according to quantity, quality, relation and Modality.
5. A, E, I and O Propositions.
6. Existential import.
7. Distribution of terms.
8. Opposition of propositions: Contrary. Sub-Contrary, Contradictory, Subaltern.

III. Deductive Systems

Marks: 20
No. of lectures: 15

1. Form and Matter.
2. The nature of formal deductive system
3. Properties of formal deductive system
4. Immediate inference: Conversion, Obversion, Contraposition and Inversion.

(Cont.)

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IV. Mediate Inference: Syllogism — Marks : 20
No of lectures: 15

1. Syllogism and deductive system.
2. General rules.
3. Figures and Moods.
4. Special rules of figures.
5. Aristotelian Dictum : Dictum De Omni et Nullo.
6. Reduction: direct and indirect.
7. Mixed Syllogism: Hypothetical - Categorical, Disjunctive - categorical and dilemma.
8. Rebutting a dilemma.

V. Enthymeme and Testing of Arguments: Marks : 25.
No.of lectures:24

1. Abridged syllogism: Enthymeme.
2. Testing of arguments.
3. Fallacies: I. Semi-logical Fallacies: i. Fallacy of Amphibology or Amphiboly, ii. Fallacy of accent, iii. Fallacy of equivocation, iv. Fallacy of figure of speech, v. Fallacy of accident, vi. Fallacy of division and vii. Fallacy of composition.

II. Fallacies of Mediate Inference: i. Fallacy of four terms, ii. Fallacy of four terms (iii) Fallacy of equivocation viz., ambiguous major, ambiguous minor and ambiguous middle, iv. Fallacy of undistributed middle, v. Fallacy of illicit major, vi. Fallacy of illicit minor, vii. Fallacy of affirming the consequent and viii. Fallacy of denying the antecedent.

4:1(83)

PAPER II

Maximum Marks : 100 Time : 3 hours.

I. Propositional Logic: Marks : 10
No. of lectures : 20

1. i. Constant and variable logical connectives: ~, ∨, ⊃, ≡.
   ii. Value and truth functions and iii. Symbolisation.
2. i. Testing of validity by truth table method, ii. tantology, contradiction, contingent.

II. Laws of Thought: Marks : 10
No. of lectures: 10

i. Law of identity, ii. Law of contradiction, iii. Law of excluded middle, and iv. Modern analysis of the lasw.

III. Induction: Marks : 10
No. of lectures : 10

i. The nature of science and scientific inquiry.
ii. Philosophy, science and philosophy of science.
iii. Scientific induction: Its marks of characteristics.
iv. Different kinds of induction: (a) Induction improperly so called or processes simulating induction, (b) Perfect induction, (c) Induction by parity of Reasoning, (d) Colligation of facts, (e) Unscientific induction or induction per simple enumeration.

IV. Inductive Procedure : Marks : 15
No. of lectures : 15

1. Observation and experiment.
2. Analysis and elimination of inessential features.
3. Hypothesis : i. its nature and forms, ii. the logic of hypothesis, its force, confirmation and acceptability. iii. Hypothesis, theory and law.
4. Generalisation: i. formulation of theory, ii. law, iii. classification of laws: primary, secondary, expirical and derivative laws.

V. Grounds of Induction: Marks : 16
No. of lectures : 15

1. Formal grounds: i. law of uniformity of nature and ii. law of causation.
2. Paradox of Induction
3. Cause: i. its marks or characteristics, ii. cause and condition, iii. moving power and collocation, iv. agent and patient, v. plurality of causes, vi. conjunction of causes and intermixture of effects.
4. Material grounds: i. observation, ii. experiment, iii. the nature of observation and experiment, iv. fallacies of observation, v. relative advantages of observation and experiment, vi. advantages of experiment over observation.

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VI. Scientific Explanation and Analogy: Marks : 10.
No. of lectures: 15.

1. Scientific explanation, i. the nature of scientific explanation, ii. popular and scientific explanation, iii. limits of scientific explanation, and iv. fallacies of explanation.
2. Analogy: i. various meanings of analogy, ii. analogy and scientific explanation, and iii. good and bad analogy.

VII. Experimental Methods: Marks : 14.
No. of lectures: 15.

1. Method of Agreement.
2. Method of Difference.
3. Joint Method of Agreement and Difference.
4. Method of Residue.
5. Method of concomitant variation.

VIII. Testing Arguments: Marks: 20
No. of lectures : 30

i. fallacies of causation, ii. fallacies of observation, iii. fallacies explanation, iv. fallacious analogy, v. potitio principii, vi. ignoratio elenchi, vii. argumentum ad hominem, viii. argumentum and populum, ix. argumendum ad ignorantian, x. argumendum ad verecundiam, and xi. argumendum and ad baculum.

Testing of arguments in Paper - I and in Paper-II are compulsory.

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HISTORY

PAPER-I

History of Modern India (1757-1947)

Max. Marks : 100 Time: Hours -100 Lectures

		Lectures
A.1.	The British Conquest of India, Foundation & expansion of the Empire	
	(a) British occupation of Bengal	3
	(b) Dual system of administration	2
	(c) Wars under Warren Hastings	2
	(d) Wars under Cornwallis	2
	(e) Expansion under Wallesley	2
	(f) Expansion under Lord Hastings	2
	(g) Dalhousie & Policy of Annexation	3
	(h) The First Anglo-Burmese War & Treaty of Yandabo	3
	(i) Structure of Company's Government	2
B.2.	Social & Cultural Policy of the Company's Government.	
	(a) British attitude towards Indian Society	2
	(b) Humanitarian Measures	2
	(c) Modern Education	2
C.3.	Social & Cultural Awakening in the first half of the 19th Century.	
	(a) Impact of Western Education	3
	(b) Raja Rammohan Roy & Indian Renaissance	3
	(c) Brahma Samaj	2
D.4.	British Economic Policy in India	
	(a) Nature of Company's Rule	2
	(b) Commercial Policy	2
	(c) Transport & Communication	2
	(d) Land Revenue Measures	2
E.5.	Challenge to British Imperialism - The Revolt of 1857	
	(a) Causes	3
	(b) Courses	2
	(c) Consequences	3
F.6.	Economic Impact of British Rule	
	(a) Description of the Traditional Economy	2
	(b) Stagnation of Agriculture	2
	(c) Modern Industries	2
	(d) Poverty & Famines	2
G.7.	Religious & Social Reform Movement after 1858	
	(a) Prarthana Samaj	1
	(b) Arya Samaj	1
	(c) Ramakrishna-Vivekananda Movement	1
	(d) Sayyid Ahmad Khan & the Aligarh School	1
	(e) Reform Movement among the Sikhs	1
	(f) Impact of the Reform Movements	2

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H.8. The Rise of Indian Nationalism	Lectures
(a) Origins of Indian Nationalism	2
(b) Early Organisations	2
(c) The Indian National Congress (formation, constitution, early programme, British attitude)	2
(d) The Swadeshi Movement	2
(e) Rise of Militancy	2
(f) Morley-Minto Reforms	2
(g) Home Rule Movement	2
(h) Montago-Chelmsford Reforms	2
(i) Emergence of Gandhi	2
(j) Khilafat & Non-Cooperation	2
(k) The Left Wing	2
(l) Civil Disobedience	2
(m) Govt. of India Act, 1935	2
(n) Quit India Movement	2
(o) INA Movement	2
(p) Transfer of Power	2
(q) Integration of the Indian States	2
	100 Lectures

Books Recommended : Text:

1. Bipan Chandra : A History of Modern India
2. R.C. Majumdar, H.C. Ray Choudhury, K. Datta. An Advanced History of India, Part III, Book I; Chapter V, 2 (A) (The First Anglo-Burmese War)

HISTORY
Paper II
History of Modern World (1760-1945)

Max. Marks 100 Time 3 hours - 100 Lectures

A.1. Industrial Revolution	Lectures
(a) Meaning	1
(b) Origin	1
(c) Nature	1
(d) Consequences	2
2. European Colonial Expansion in Asia	
(a) Causes of Colonial Expansion	2
(b) European Trade & British Colonialism in India	2
(c) European Colonies in South East Asia	4
3. American War of Independence	
(a) Causes	2
(b) Courses	2
(c) Consequences	2

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		Lectures
B.4.	French Revolution	
	(a) Back ground	2
	(b) causes	3
	(c) Courses	3
	(d) Consequences	2
B.5.	Napoleon	
	(a) Rise of Napoleon	1
	(b) Reforms and their impact	2
	(c) Napoleonic Empire	2
	(d) Downfall	2
C.6.	Nationalism in Europe & Asia	
	(i) Growth of Nationalism in Europe	2
	(a) Italy	3
	(b) Germany	3
	(ii) Growth of Nationalism in Asia	2
	(a) China	3
	(b) Japan	3
D.7.	Imperialism in Africa	
	(a) Africa before the arrival of European Powers	4
	(b) Advent of the Europeans	3
	(c) Rivalries among the European Powers	3
	(d) Partition of Africa	3
	(e) Impact on African Societies	3
E.8.	First World War	
	(a) Causes	2
	(b) Courses	2
	(c) Peace Treaties	3
E.9.	League of Nations	
	(a) Origin	1
	(b) Structure	1
	(c) Achievement & Failures	2
E.10.	Bolshevik Revolution	
	(a) Causes	2
	(b) Courses	2
	(c) Impact	2
F.11.	Second World War	
	(a) Causes	4
	(b) Courses	3
	(c) Consequences	4
F.12.	UNO	
	(a) Origin	2
	(b) Structure	2
		100 Lectures

Text Book

NEHU Publication - History of Modern World

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4:1(88) ANNEXURE-I

HOME SCIENCE

FIRST YEAR: PAPER I : MAXIMUM MARKS : 75

UNIT - I : HOME MAN GEMENT

1. Meaning of a house, the difference between a home and a house, principles governing the choice and planning of a house, furniture selection and arrangement of different rooms in a house.
2. Home decoration, the colour schemes, accessories for home decoration, principles and types of flower arrangement.
3. The purpose and methods of cleaning the home, household pests and their prevention.
4. Meaning of recourees, classification and characteristics of resources, judicious utlisation of resources; labour saving devices.
5. Principles of budgetting, types of budgets, accounting finances, different methods of accounting, saving and investment.
6. Duties of a home-maker; personal, social and economical.

UNIT-II : FOOD AND NUTRITION

1. Meaning and defination of the term Health, factors influencing good health.
2. Classification of food into groups and its functions; constituents of food (Nutrients).
3. Balanced Diet, factors involved in planning a balanced diet, nutritional requirements of various age groups.
4. Digestive system; digestion, absorption and metabolism of food, chemistry and function of digestive enzymes.
5. Principles and methods of food preparation and preservation.

UNIT-III- CHEMISTRY

1. Elements, compounds, atoms, molecule, valency, formulae, atomic and molecular weight, chemical equation, chemical and physical changes, acids, bases and salts.
2. Common laboratory processes, a) Sedimentation, b) Decantation, c) Filtration, d) Sublimation, e) Distillation, f) Crystallisation.
3. Colloids, Dialysis, Osmosis, Catalysis.
4. Preparation of Oxygen, Hydrogen, Nitrogen, Carbon Dioxide, Ammonia, Chlorine, Sulphur Dioxide.
5. Preparation of Sulphuric acid, Nitric acid and Hydrochloric acid.
6. Water, Hard and Soft Water.

4.1(89)

5:2:3(50)

HOME SCIENCE

SECOND YEAR: PAPER-II : MAXIMUM MARKS - 75

UNIT-I : TEXTILES AND CLOTHING

1. Study of fibres (a) classification of fibres, (b) Manufacture, properties and uses of cotton, silk, wool and rayon.
2. Laudry work: (a) Laudry Room, equipment and cleansing reagents, blueing and stiffening agents, stain removal, (b) Principles of washing and finishing, (c) Different types of Dyes, study of indigenous dyes.
3. Clothing, (a) Planning and buying of clothes, (b) Selection of garments for a College goer.

UNIT - II: CHILD DEVELOPMENT

1. Meaning and principles of growth and development, factors affecting growth and development.
2. Pre and postnatal care of the mother.
3. Physical care of the baby; feeding (Breast and artificial feeding), weaning, bathing, clothing, toilet training, playing and medical care (immunization, ailments and dieseses of infancy).

UNIT -III : PHYSICS

1. Measurement of mass and weight, pressure of liquid, Archimedes ' Principle, atmospheric pressure and its measurement by Fortin's barometer, Pumps-suction and exhaust pump.
2. Principle of construction of clinical thermometer and its uses, calorimetry; unit of heat, latent heat, cooling produced due to evaporation, refrigeration, three modes of transmission of heat in connection with thermos flask ; pressure cooker.
3. Refraction through convex and concave lenses in connection with hypermetropia and myopia; production and propagation of sound, sound reproduction in a record player.
4. Properties of conductors and insulators, production of current in primary cells simple voltaic cell and Lechlanche cell, use of lechlanche cell as [illegible] battery; Properties of magnets, electro-magnets and their uses in telephone , Heating effect of current-electric stove, iron, immersion rod, importance of earthing electrical appliances, practical unit of electrical energy.

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PAPER - III

PRACTICALS : MAXIMUM MARKS - 50

UNIT -I : FOOD AND NUTRITION

1. Preparation of common vegetarian dishes with cereals, pulses and vegetables.
2. Preparation of common non-vegetarian dishes with meat, fish and eggs.
3. Preparation of sweet dishes, halwas, barfis, etc.
4. Milk preparations - puddings, Kheer etc.

UNIT-II : TEXTILES AND CLOTHING

1. Construction of apron, skirt and any 2 household articles- wall hanging, bags , table cloth, tea cosy, napkins etc.
2. Washing and finishing of garments made of : Cotton, silk, wool and rayon.
3. Removal of common stains like tea, coffee, mud, oil, grease, fruit, ink, lipstick etc.
4. Microscopic study of textile fibres like cotton, silk, wool and rayon.

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PAPER - III

PRACTICALS : MAXIMUM MARKS - 50

UNIT - I : FOOD AND NUTRITION

1. Preparation of common vegetarian dishes with cereals, pulses and vegetables.
2. Preparation of common non-vegetarian dishes with meat, fish and eggs.
3. Preparation of sweet dishes, halwas, barfis, etc.
4. Milk preparation - puddings, Kheer etc.

UNIT -II : TEXTILES AND CLOTHING

1. Construction of apron, skirt and any 2 household articles - wall hanging, bags, table cloth, tea cosy, napkins etc.
2. Washing and finishing of garments made of : Cotton, silk, wool and rayon.
3. Removal of common stains like tea, coffee, mud, oil, grease, fruit, ink, lipstick etc.
4. Microscopic study of textile fibres like cotton, silk, wool and rayon.

PRE- UNIVERSITY -HOME SCIENCE
SUGGESTED READINGS: FIRST YEAR

1. Mohinder Mann : Management for Indian families. Kalyani Publishers, Delhi.
2. Stella Soundararaj : A textbook of Household Arts, Orient Longman, Delhi.
3. The Educational Planning group : Food and Nutrition, Arya Publishing House, Delhi.
4. M. Swaminathan : Handbook of Food & Nutrition, Vol.I & Ganesh & Co. Madras.
5. Mitra : Textbook of Inorganic Chemistry.

SECOND YEAR

1. Deulkar.D : Household Textiles & Laundry work Atma Ram & Sons, Delhi.
2. Duntyagi, Susheela : Fundamentals of Textiles & their care Orient Longmans, Bombay.
3. K.C. Panda : Elements of Child Development, Kalyani Publishers, N. Delhi.
4. Hurlock. E : Child Development McGraw Hill Book Co, INC, New York.
5. D.B. Sinha : Intermediate Physics Vol. I & II

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Paper 1

ELEMENTS OF POLITICAL SCIENCE

Unit I - **Introduction**

Definition, Scope and Importance

Normative and Empirical approach

Unit II - **State**

Definition and elements of the State

State and Society

State and Government

State and Association.

Unit III- **Forms of Government**

Democratic (liberal and socialist)

Authoritarian (Nazism and Fascism)

Federal and Unitary.

Parliamentary and Presidential.

Unit IV - **Organs of Government**

Functions of the Organs of Government

Theory of Separation of Powers

Unit V - **Electorate**

Meaning

Universal Adult Suffrage

Direct Democratic Devices

Forms of representation.

Unit VI - **Public Opinion**

Meaning and importance

Agencies and conditions.

Unit VII- **Political Parties and Pressure Groups**

Definition and functions

Types of Party system

Interest Groups and Pressure Groups - Role and functions.

Unit VIII- **Law**

Meaning, definition and kinds

Sources of Law.

Unit IX - **Liberty and Equality**

Meaning and definition

Kinds

Relationships between liberty and equality.

Unit X - **Rights**

Meaning and Kinds

Relationship between rights and duties.

Books :-

Elements of Political Science
N.C.E.R.T.

Principles of Modern Political Science
J.C. Johari, Sterling, New Delhi 1991.

Political Science (for +2 stage).
Durga Kant Sarman, Wiley Eastern Ltd., 1992.

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PAPER II

ELEMENTS OF INDIAN CONSTITUTION

Unit I - Introduction
Preamble - its meaning and ideals
Characteristics

Unit II - Fundamental Rights
Nature of Fundamental Rights
Categories of Fundamental Rights
Fundamental Duties.

Unit III - Directive Principles
Meaning, nature and types
Fundamental Rights and Directive Principles.

Unit IV - Federalism in India
Nature of Federalism
Union-State Relationship

Unit V - Union Executive
President - election, powers and functions
Council of Ministers - composition and functions
Prime Minister - powers and functions.

Unit VI - Union Legislature
Parliament - composition, powers and functions
Law making procedure.

Unit VII - Union Judiciary
Supreme Court - composition, powers and jurisdiction.

Unit VIII - State Executive
Governor - appointment, powers and functions
Council of Ministers - composition and functions
Chief Minister - powers and functions.

Unit IX - State Legislature
Composition, powers and functions of Legislative Assembly and Legislative Council
Law making procedure.

Unit X - State Judiciary
High Court - composition, powers and jurisdiction

Unit XI - Sixth Schedule
District Council - composition, powers and function

Unit XII - Amendment
Procedure of amendment

Books :-

Introduction to the Constitution of India
Durgadas Basu, 1994.

Elements of Indian Constitution
N.C.E.R.T.

4:1(84) 5:2:3(73) Annexure - 'R'

SYLLABUS FOR PRE-UNIVERSITY COMMERCE (P.U. Com)

SALIENT FEATURES:

A student to pass Pre-University Commerce Examination is required to appear on 10 papers (2 papers on English/MIL, 2 papers on Economics and 6 papers on Commerce) each carrying 100 marks. Out of these ten papers, five papers are designed for 1st year and the rest five for the second year.

Provision is also made to offer four groups of Extra optional courses, each consisting of two papers; one for the first year and the other for the Second year. These papers are purely optional for individual student to opt and the individual college to offer. Interested students can opt for only one of the four groups. The excess of aggregate of marks secured in these two papers over 60 shall be added on their total marks secured out of 10 compulsory papers.

Hence a student without extra optional course shall appear on 10 papers and a student with extra optional courses on 12 papers divided equally into two years.

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NORTH EASTERN HILL UNIVERSITY
SHILLONG- 793022

PRE-UNIVERSITY COMMERCE COURSE CONTENTS:

First year.	P.U. Com.	100	. MIL/Alternative English.
	P.U. Com.	101	. Economics. PAPER-I.
	P.U. Com.	102	. Book Keeping.
	P.U. Com.	103	. Commercial Arithmetic.
	P.U. Com.	104	. Commercial Geography.
Second Year.	P.U. Com.	200	. English.
	P.U. Com.	201	. Economics II.
	P.U. Com.	202	. Elementary Accounting.
	P.U. Com.	203	. Business Organisation.
	P.U. Com.	204	. Insurance.

Extra Optional Groups.

GROUP -A	P.U. Com.	105 (A)	. Salesmanship & Advertising.
	P.U. Com.	205 (A)	Commercial Mathematics.
GROUP- B	P.U. Com	105 (B)	Computer Application- I.
	P.U. Com.	205 (B)	Computer Application- II.
GROUP- C.	P.U. Com.	105 (C)	Secretarial Practice.
	P.U. Com.	205 (C)	Typewriting & Shorthand.
GROUP- D.	P.U. Com.	105 (D)	Mathematics - I.
	P.U. Com.	205 (D)	Mathematics - II.

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P.U.Com. 102 Book Keeping.

1. Introduction: Meaning, objective and significance of Book Keeping, Principle and practice of Double Entry Book-Keeping System, Difference between Book Keeping and Accountancy, Accounting and Auditing Equatioh,Limitations of Book-Keeping.

2. Books of Accounts : Books of Original Entries, Principal Books, Journalising and Posting, Balancing of Ledger Accounts.

3. Cash Book: Nature of Cash Book, Different Tupes of Cash Book-Single Column, Double Column and Triple Column, Petty Cash Book, Analytical Petty Cash Book under Imprest System.

4. Bank Reconciliation Statement: Meqning, Need for its preparation Reasons for the differences between Cash Book and Passbook, Preparation of Bank Reconciliation Statement.

5. Provision for Bad and Doubtful Debts: Meaning of Bad debts, Doubtful debts, preparation of Journal Entries and Relevant Ledger Accounts.

6. Provision for Discount on Debtors and Creditors: Meaning of Discount on Debtors and Creditors, Purpose of such provisions, Preparation of necessqry Journal Entries and Ledger Accounts.

7. Depreciation : Meaning and Definition, Need for Providing Depreciation, Basic Factors affecting Depreciation, Methods of of providing Depreciation, Straight Line Method,Reducing Balance Method, Journal Entries and Necessary Ledger Accounts.

8. Trial Balance: Meaning and objects, Nature, Procedure of preparation, opening and closing Entries, Suspense Account.

9. Final Accounts: Meaning and Objectives, Components of Final Accounts, Trading Accounts, Profit & Loss Account,Balance Sheet, Their nature and charqcteristics.

10. Preparation of Final Accounts of a Sole Trader with Simple Adjustments:

BOOKS RECOMMENDED:

(1) T.S.Grewal : Double Entry Book Keeping (Sultan Chand & Sons)

(2) Grewal,Smarth,Somani & Parekh. : First Course in Book Keeping & Accountancy (Sultan Chand & Sons)

(3) T.S.Grewal. : Introduction to Accountancy. (S Chand & Sons)

(4) Jain,Narayan,Vaish. : Book Keeping and Accounts(part-I)

(5) Mohan, Juneja,Chawla & Saxsena : Double Entry Book Keeping (Kalyani Publishers)

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P.U.Com. 103. COMMERCIAL ARITHMETIC. (97)

1. Simplification, Metric System of Weight and Measures, Approximation Errors of Calculation- Absolute, Relative and Percentage Error.

2. Percentage, Method of mixture or allegation, profit and loss, marked price, Discount-Cash and Trade, Profit in relation to turnover & cost.

3. Average - Simple and weighted (individual observations)

4. Simple Interest, Average rate of interest, Interest on Instalment payment.

5. Ratio, Proportion and Variation.

6. Bankers' Discount and True Discount, Bill Value and Present Value, Commission and Brokerage.

7. Logarithm- Formula and its application, Multiplication and Division, Use of Tables of Logarithm and Antilogarithm, Logarithm Equation.

8. Compound Interest, Uniform Growth.

9. Uniform Periodical Reduction in Value, Annuities.

10. Graphical Representation of Quantitative Data, Line Charts, Bar Charts, Pie Charts- Definition, Importance and Relative Adventages and Disadvantages.

BOOK RECOMMENDED:

(1) Iyer and Bari : Commercial Arithmetic. (Sultan Chand & Son)

(2) Basu, Bhattacharjee & Choudhuri. : A Text Book of Commercial Arithmetic. (Modern Publishing House, Calcutta)

(3) P.L.Ganguli : Commercial Arithmetic.

(4) R.Gupta. : Intermediate Commercial Arithmetic.

(5) Mazumdar and Mitra. : Commercial Arithmetic.

(6) Chanda & Nag. : Commercial Arithmetic (Kalyani Publishers)

(7) D.C.Sutaria. : Practical Commercial Arithmetic.

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9. Industries : Industries and Economic Development, Factors influencing location of Industries, Major Industries in India- Textile Industry, Iron and Steel Industry, Engineering and Chemical Industry. Industries in North East India.

10. Geography of North Eastern Region : Physical Features, Climate, Agriculture and Forest, Economic Development and Problems Associated with Economic Development.

BOOKS RECOMMENDED :

(1) Khanna & Gupta : Economic & Commercial Geography, (Sultan Chand & Sons, New Delhi.)

(2) M.C.Ghosh : Modern Economic Geography,Modern Book Agency, Calcutta.

(3) Sen and Chakraborty. : Economic and Commercial Geography Companion,Dass Publishing Concern, Calcutta.

(4) A.K.Agrawal : Economic Development in North East India.

(5) S.K.Sadhukhan : Economic Geography, (Sultan Chand & Sans.

(6) Guha and Chatterjee : A Study of Resources.

(7) A.Das Gupta. : Economic and Commercial Geography.

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P.U.Com: 104. COMMERCIAL GEOGRAPHY.

1. Introduction: Nature and scope of Economic Geography: Economic Geography as a dynamic science, Function and Importance, Man and his environment, Culture and Economic Development, Natural Regions of the world, Study of main types Viz. Amazon, Sarannoch, Monsoon, Mediterian West Europian, Temparate Grass Land, Its environmental effects on Economic Development.

2. World population: Role of man power in economic development, Density ratio, settlement pattern, causes of uneven distribution of population. Population in India, Causes of high growth and the impacts of population explosion in India.

3. Forest Resources and Animals: Forest and its utilisation, types of forest, Forest products, Forest Region-Europe, North America, Asia, Indian Forests-Lumbering Industry. Aforestation and Deforestation, Conservation of Forest. Man and Animals, Major species of animals and their distribution, Animal Industry, Dairy Industry & Leather products and Poultry, Fishing and its significance, Fishing grounds of India, World fish market.

4. Soil, Irrigation and Conservation: Soil and its type, climate Fertility of Soil, Soil Conservation-Mechanism and Utility, Irrigation types, Multipurpose Projects.

5. Agriculture: Need and significance of Agricultural Development Factors influencing Agriculture, Tupes of Agriculture, Details of Food Crops in India, Industrial Crops, Cash Crops and Other Crops in the context of North East India.

6. Mineral Resources: General Consideration, Classification of Minerals, Gold, Silver, Platinum, Lead, Manganese, Zinc, Copper, Mercury, Iron, Ore, Coal Petrolium, Natural Gas, Atomic Energy, Uranium etc. in the Indian context and also in the context of North East India.

7. Power Resources: HydroElectric Power, Nuclear Power, Non-conventional Energy, Power Projects in India, Power situation in North East India.

8. Transport System: Development of transport, Its significance to Industrialisation, Modern Means of Transportation, Advantages and Disadvantages of different Modes of transportation Rail, Road, Air, Sea, The Suez Canal, The Panama Canal. Indian Major Ports, Transport in North East India.

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P.U.Com- 202- ELEMENTARY ACCOUNTING:

1. Final Accounts in Non Profit Organisations; Capital and Revenue items, Difference between them, Balance Sheet of Non Profit Organisations.

2. Single Entry System: Meaning, Drawbacks, Determination of Profit Preparation of Statement of Affairs (Excluding conversion method)

3. Fill of Exchange: Bill transactions, Acceptance, Endorsement, Discounting, Retirement, Renewal and Collection of Bills, Necessary entries and Accounts in the Books of both Drawer and Drawee.

4. Rectification of Errors: Types of Errors, Rectification of Errors, Creation of Suspense Account.

5. Consignment Accounts:Nature of consignment Business,Account sales, Proforma Invoice, Del Credre Commission, Valuation of Stock, Normal and Abnormal Loss, Goods sent on Invoiced Price, Journal Entries and Ledger Accounts in the books of both Consignor and Consignee.

6. Joint Venture Accounts:Nature,Different Methods of preparation of Accounts, Preparation of Journal Entries and Ledger Accounts in the books of the parties.

7. Average Due Date and Account current: Average Due date calculation, preparation of account current.

8. Partnership Accounts (i) Meaning and Definition of Partnership Appropriation of Profit, Capital and Drawing Accounts-Fixed Capital Method and Fluctuating Capital Method,Balancesheet.

Partnership Accounts (ii) Admission of a new partner, Treatment of Goodwill, Revaluation of Assets and Liabilities,Retirement of a partner, Share of a Deceased Partner.

9. Company Accountss: Meaning of a Company, Its Statutory and Statistical Books, Issue of Shares and Debentures,Application Allotment, Calls, Call in Arears and Call in advance.

BOOKS RECOMMENDED:

(1) Grewal,Smarth,Somani Parekh. : First course in Book Keeping and Accounting (Sultan Chand &Sons)
(2) Jain Narayan Vaish. : Book Keeping and Accounts (Pt I&II)
(3) Mohan,Juneja,Chawla & Saxsena.. : Double Entry Book Keeping (Kalyani publishers)
(4) T.S.Grewal : Double Entry Book Keeping.
(5) T.S.Grewal : Introduction to Accountancy

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8. Foreign Trade: Meaning and importance, Documents used in Export and Import, Procedure of Export and Import, Role of Middlemen in Promoting Foreign Trade, Kinds of Middlemen and their functions.

9. Banks. : Definition, Functions of Commercial Banks, Central Bank, Negotiable Instruments- Meaning, Types,-Bills of Exchange, Promissory Note, Cheque, Hundis.

10. Business Association: Meaning and Definition, Horizontal and Vertical Association, Trade Associations, Chambers of Commerce, Functions, Merits and Demerits.

BOOK RECOMMENDED:

(1) A.N.Agarwal : Business Methods Vol.I & II.

(2) Y.P.Verma. : Elements and Organisation of Commerce (S.Chand & Sons)

(3) N.C.Choudhury. : Outlines of Business Methods.

(4) S.S.Davar. : Elementary Theory and Practice of Commerce.

(5) R.K.Sharma &S.K.Gupta. : Business Organisation (Kalyani publishers)

(6) N.C.Ray Choudhury : Business Organisation(Modern Book Agency,Calcutta)

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P.U.Com. 203: BUSINESS ORGANISATION.

1. Concept of Business: Evolution of business, Definition, Features objectives of business, Social responsibility of a business, Reguisits of a successful business, Problems faced by contemporary business houses.

2. Business Organisation. Meaning, Principles of Sound Organisation Forms of Business Organisation-Sole Proprietorship, Partnership-Merits and Demerits, Kinds of Firms, Kinds of Partners, Limited Partnership, Effects of Registration, Co-ownership, Partnership deed, Goodwill, Reconstitution, Dissolution of Partnership, Cooperative Business- Nature, Merits and Demerits.

3. Company Organisation. Features, Kinds of Company, Role of Promoter, Formation, Merits and demerits, Comparison between partnership and company, Share Capital,-Equity, Preference, difference between equity and preference share, Debenture, kinds of debenture, difference between share and debenture.

4. Office Organisation: Meaning and definition, Functions of an office, Internal and External office organisation, Filing system, Indexing system, methods of copying and duplicating-appliances in Modern office.

5. Office Communication.: Meaning, objective and importance, types of communication, word processor, TELEX, FACS I MILE (FAX) -E-MAIL, Teleconference, Telephone Answering machine.

6. Office Correspondence.: Meaning, objective and importance, layout of business letters, Kinds of business letters-letters of enquiry, letters of quotation, letters of order placement, Sales letters, Circular letters, Credit letters, Collection letters, letters of complaints, Claims and adjustment.

7. Home Trade : Meaning, importance, terms and conditions, documents used, procedure, channels of distribution,-Wholesalers and retailers- their functions, relative merits, types of wholesalers and Retailers, Departmental stores, Multiple store, Super markets, mail order business, [illegible]

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4:1(103)

9. Marine Insurance (1)

Marine Insurance and its importance- Nature of Marine Insurance and principles- Elements and Rosks involved in a marine policy- subject matter of Marine Insurance- Methods of effecting marine Insurance policies.

10. Marine Insurance (2)

Different kinds of Marine Insurance policies- Clauses and pharaseology of a Marine policy-Average-particular Average and General Average- York Antewerp Rules- Constructive Total Loss- Actual Total Loss-Bottomry and Respondentia Bonds-salvage claim in marine Insurance- Marine Risks or perils-Warranties-Assignment.

BOOKS RECOMMENDED:

(1) Ghosh & Agarwala : Insurance Principles Practice and Legislation.

(2) Mitra. : Guide to Marine, Fire and Accident Insurance.

(3) Mitra : Life Insurance.

(4) M.N.Mishra. : Insurance Principles and Practice (S.Chand & sons)

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5:2:3(83)

P.U.Com- 204-ELEMENTS OF INSURANCE:

1) Introduction: Nature and Importance of Insurance-Assurance and Insurance- Insurance and Gambling.

2) Kinds of Insurance: Re-insurance and Double Insurance-Organisation of Insurance-Life Insurance and General Insurance.

3) Life Insurance (1)

Importance of Life Insurance-Elements of Protection and Investment-procedure of effecting Life Insurance-Kinds of Life Insurance Policies-Annuities-Principal Clauses of Life policy.

4) Life Insurance (2)

Assignment-Nomination-Premium-Surrender value- paid-up value-Automatic Non-forfeiture-Acturial Valuation- Revival of Lapsed Policies- Loans on policies-Basic of premium calculation-mortality tables- Loading-Life Fund-Bonus-Nationalization of Life Insurance- Organisation and functions of Life Insurance corporation.

5) General Insurance (1)

Fire Insurance-Marine Insurance-Accident Insurance-Fidelity Guarantee Insurance.

6) General Insurance: (2)

Workman's compensation Insurance Employee's State Insurance-Distinction between Life, Fire and Marine Insurance-Nationalisation of General Insurance.

7) Fire Insurance (1)

Fire Insurance and its Importance-Scope of Fire Insurance-Risk in Fire Insurance Fire Insurance contract.

8) Fire Insurance (2)

Procedure of effecting Fire Insurance Tariff and Non Tariff Rates of Premium-Kinds of Fire Insurance Policies-Assignment of Policy-Renewal of Fire Policy-The Claim and its settlement. Double Insurance Reinstatement subrogation.

4:1(105)
~~5:2:3(84)~~

P.U.Com. 105 (A) SALESMANSHIP & ADVERTISING.

1. Meaning: Definition and objectives of Salesmanship, Origin and Development of Salesmanship, Role of Salesmanship in modern Distribution system.
2. Types of Salesmen: Their duties, Responsibilities of a Salesman, Problems faced by Salesmen, How to overcome these problems, Qualification and Qualities of a good salesman.
3. Study of Buyingmotives, Types of Customers, Sales Talk, Distribution, Its importance, Channels of distribution.
4. The organisation of sales department. Its need, structure and importance, Duties oa a Sales Manager, Qualities of a good Sales Manager, Salesman's reports and their use.
5. Selection of Salesman, its procedure, training of salesman, Training methods and adventages of training, Sales conference Remunerating salesman, controlling and motivating salesman Allocation of sales territories.
6. Knowledge of goods, importance and nature of product knowledge Displaying of goods, Interior and Exterior Display, Windowdressing Showroom, Exhibition.
7. Definition meaning and objective of advertising, Its functions and importance, criticism against advertising.
8. Advertising Vrs. Publicity, Different types of Advertising, their uses, relative advantages and disadvantages, Advertisement Agencies.
9. Media of advertising, Newspaper, Magazine, Radio Advertising, Television Advertising, Film Advertising, Direct Mail Advertising, Outdoor Advertising and other medias.
10. Advertisement copy, Requisites of good advertising, Social responsibility of advertising.

BOOKS RECOMMENDED:

(1) Rustom.S.Davar & S.R.Davar : Salesmanship and Publicity (progressive copies)
(2) Jagat, Mali & Pradhan : Salesmanship & Publicity.
(3) Hanghton. : Salesmanship and Advertisement.
(4) Wilters, Winter W.Jr. : Advertising (Mc Graw Hill Book Co)
(5) Baer, Earl E. : Salesmanship (Mc Graw Hill Book Co.)
(6) A.P.Nayak and S.C.Sahoo : Salesmanship, Sales Management and Advertising (Book & Books Bhubaneswar)

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5:2:3(85)

P.U.Com. 205(A) COMMERCIAL MATHEMATICS:

(1) Ratio,Proportion,Variation,Logarithm,Progression-AP&GP &HP (At a higher level than in the 1st year course on commercial Arithmetic)

(2) Equation- Simple,linear and simultaneous equations, Quadratic equation, surd and Indices.

(3) Determinants- Evaluation (upto 3rd order) as eliminants, verification of their elementary properties,Matrices Addition, substraction and multiplication.

(4) Permutation and combinations and binomial theorem.

(5) Trigonmetrical ratios and formuli,Multiple and submultiple angles,solution of trigonometic equations.

(6) Height and Distance,relation between Sides and Angles of a Triangle,Solution of Triangle .

(7) Area and Perimeter of Triangle,Rectilenear Figures,Parallelogram, Circle,Polygon.

(8) Volume of Cuboid,Cylinder,cones,Sphere,Surface area of Cylinder cone, sphere and cones.

(9) Rectangular cartesian coordinates in a plane,Distance between Points,Section formula,Area of a Triangle Lucus and its equation ,Equations to Straight line.

(10) Calculation of mean,Median and Mode-Simple Problems for Individual,Discrete and Continuous series(only Direct Method).

BOOK RECOMMENDED:

(1) N.K,Nag : Elementary Mathematics and Elementary Statistics(Chatterjee Publishing Centre)
(2) I.R.Gupta. : Commercial Mathematics.
(3) A.M.Chakravarty : Cost Accountant's Mathematics.
(4) R.F.J.Dew Hurst. : Mathematics for Accountants and Managers.
(5) Das & Mukherjee : Intermediate Trigonometry.
(6) R.K.Chakraborty. : Co-ordinate Geometry.
(7) A.C.Sarkar. : Pre-University Mathematics Tuter. (Books syndicate Pvt.Ltd.Calcutta)
(8) Chanda & Nag. : Commercial Mathematics(Kalyani Publishers.
(9) Chanda & Nag. : Basic Mathematics and Business Statistics (Kalyani Publishers.

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COMPUTER APPLICATIONS.

(An Elective subject at the Pre-University level)

OBJECTIVE:

This course of study in computer Applications for P.U.Students is meant to be one of the compulsory subject or an optional fourth subject in their P.U.curriculum.The course is employment oriented: a student on completion of this course would be in a position to execute most DOS commands and to carry out any task in word processing,using Word Star,without any further external guidance.However, sufficient theoretical aspects have been added to give the student an insight into the fundamental workings of a Computer as well as a good knowledge of BASIC language programming.

Eligibility:

The course is open to Pre University students of the Arts,Science and Commerce Streams.It is recommended that students be familiar with the use of a typewriter.

Duration of the course:

The course is to be completed in TWO accademic years like all the o other subjects of the Pre-University course.Paper 1 is to be completed in the first year and paper 2 in the second year.

Course Structure:

105 (B) Paper 1 : Part A : Digital computer Fundamentals (20 %)
Part B : Basic DOS commands (30%)
Part C : Word Processing:Word Star (50%)

205 (B) Paper 2 : Part A : Digital computer fundamentals (20%)
Part B : Advanced DOS commands (30%)
Part C : Basic Programming (50%)

Detailed Syllabus:

105 (B) Paper 1 : Part A : Digital computer fundamentals.

Instruction to computers:Definitions,Characteristics,Capabilities, Classifications of Computers,Programme,Hardware/Software,Basic components of a digital computer,Stored programme concept,RAM,RUM, REGISTERS.

Introcuction to machine instructions,Assembly languages and high level languages,Interpreters,Compilers.

Part 1:PartB :: Basic DOS commands.

The students should be conversent with the features of HS-DOS listed below.

Terms to know : Program, File,Filename,Directory and Directory structure,volume label,Disc,Drives,Drive,Name,Prompt path,pathnames, wildcare, Head,Cylinder Section, commands,discopy, format

5:2:3(87) 4:1(108)

Paper 1 : Part C :: Word Processing. Word star

Word processing basics, economics of word processing, Using word processing in the business world. Features of word processing systems.

The students should be conversant with the use of Word star. 5.0 with regard to the following:

Cursor control, Deletion, Insertion, Wordwrap, Justification, Page formatting, Search and Replace, Text rearrangement and boilerplating, Block operations.

Spelling check, Thesaurus, Footnotes, endnotes.

Printer Controls: Bold, double printing, underline, line spacing page breaks, hyphenation, superscript, subscript, front selection, printer selection, Printing.

Mailmerge, Use of Dot commands, Use of Macros.

205(B) Paper 2 : Part A :: Digital Computer Fundamentals

Number systems (Binary, Octal, Decimal and Mexa Decimal systems) Inter-conversion of Number systems.

Coding of non-numeric data: ACSII and EBCDIC Codes, Introduction to Computer keyboards and format of stored information, intergers, fractions, strings, Binary Representation, Bits, Bytes, Words.

Boolean Algebra :Boolean Theorems, Truth Tables, Logic Functions, Canonical terms.

Paper 2 : Part B :: Advanced DOS Commands.

student should be conversant with the features of MS-DOS listed below:

Command append, assign, attrib, backup, break, chep, command,comp, ctty, discomp, exe2bin, exit, fastopen, fc, find, graftabl,graphics, join,keyb, label, mem, nlsfunc, path, prompt, recover, ren,replace, restore,rmdir, set, share, sort, subst, sys, tree, type,ver, verify, vol, xcopy.

Installation of MS-DOS, using FDISC program, using FDISC program, Batch processing, purpose and use of Autoexec, bat and config sys files.Use of DOSSHELL program,configuring the System using select programm,Installation of Device Drivers.

Paper 2 : Part C :: BASIC Programming.

History of BSIC,Data Types, Data Representation, Constants,variables, Arithmetic Operators and Expressions,Heirarchy of Arithmetic operations. Structure of BSIC Program.

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5:2:3(88)(107)

Simple commands : LET, INPUT, PRINT, END, REM,

Branching and Looping: Relational Operators, IF-THEN, ON-TO-GO, STOP, FOR-TO, NEXT Statements, Nested Loops.

Library functions, Lists and Tables(Arrays), Subscripted variables, DIM, HEAD, DATA, RESTORE Statements.

Functions and Subroutines, Defining and referencing functions, multiline functions, CHANGE statements, ASC, CHRS and RND functions, Defining and referencing, Subroutines, GOSUB Statements.

List of Book recommended.

1. Digital Computer Fundamentals Thomas C Bartree. 6th Edition McGraw Hill International Edition.
2. An Introduction to Digital Computer Design V.Rajaraman & T.Radhakrishnan, 3rd Edition, Prentice Hall of India Pvt.Ltd.
3. Programming with BASIC, Schaum's Outline Series, Byron S. Gottfried, 3rd Edition, McGraw Hill International Edition.
4. Microsoft MS-DOS User's Guide and User's Reference, Version 4.01).
5. The ABC's of DOS 4, Allan Miller.
6. Word Star 5.0 Manual, Walter Bencham.
7. Wordstar 5.0 Professional Hand Book.

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5:2:3(89)(110)

P.U. COM 105(C) : SECRETARIAL PRACTICE.

Company Secretariship - Meaning and objecgives.

1. Company Secretary's role, duties and liabilities in an organisation.
2. Appointment of Company Secretary-Qualifications & Disqualifications, Position of a Company Secretary. Skills required to be an efficient Company Secretary.
3. Formation of Company-Private and Public, Promotion,Memorandum of Association, Articles of Association, Incorporation,Registration.
4. Commencement of Business, Underwriting, Register of Members, Annual Returns.
5. Capital.Classes of Capital,type of share, Allotment of Shares, Calls, Forfeiture, Transfer and transmission of Share Certificates, Share Warrant, Dividend Warrants, Alteration of Share Capital.
6. Borrowing Powers and Methods, Debentures, Kinds, Issue and Conditions relating to issue and redemption of Debentures, Dividend Warrants.
7. Management - Directors, Managing Directors, Managers, Auditors-Their Appointment, Powers, duties and remunerations.
8. Conversion Conversion of Companies-Private into Public and Public into Private.
9. Meeting - Convening and Conduct of meetings, notices, agents, Quorum, powers and duties of Chairman, Voting and Proxies, Resolutions, Amendments, Formal Motions and minutes.
10. Kinds of Company Meeting - Meeting of Directors, Meeting of Shareholders.

Books Recommended:

1. S.A.Sherlekar : Secretarial Practice
2. M.C.Shukla & S.S.Gulshan : Secretarial Practice.

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4:1(111)
5:2:3(90)

PU COM 205(C) TYPEWRITING & SHORTHAND

Typewriting (50 marks)

Mechanism of Typewriter, its different parts, care of the machine, Lessons on Blind Touch System, Speed Practice, Display of matters - margin, Centering, Correction.

Minimum Speed to be attained - 30 words per minute.

Shorthand (50 marks)

Importance of Shorthand in the modern age, theories covering Hooks, Loops, Circles, Consonants, Vowels, knowledge covering Grammalogues Phrases - Banking, Insurance, Railway, Shipping, Elementary Contractions and intersections etc.

Minimum Speed to be attained - 60 words per minute.

Class work:- 3 periods per week for typewriting
3 periods per week for Shorthand.

These classes should normally be held during afternoon Session particularly after all the major classes are over. For typewriting every student during the class period should have access to a single typemachine. For practice under the guidance of the instructor and supervision of the lecturer. Similarly the Shorthand Classes shall be conducted with the help of an shorthand instructor under the supervision of a teacher.

Qualification for Instructors/Evaluators

Typewriting - Graduate with a diploma (6 months) Certificate on typewriting and typing experience of minimum 5 years.

Shorthand - Graduate with a diploma (1 year) Certificate on Stenography/Shorthand and relevant experience of minimum 5 years.

The Colleges intending to offer this paper may arrange the instructors on a part time basis.

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5:2:3(91)

Evaluation -

Examination Duration for Typewriting	-	30 minutes
Shorthand	-	30 minutes

Marks : Typecopying of passage - Speed Test	-	30 marks
Typecopying of passage - Accuracy test	-	20 marks
Shorthand Theory Test (Verbal)	-	10 marks
Transcription from Shorthand to English	-	10 marks
Dictation Taking in Shorthand i.e. Transcription from Engl sh to Shorthand	-	25 narks
Punctuation		5 marks
		100 marks

5:2:3(92) (113)

PU COM 105 (D) MATHEMATICS (1)

ALGEBRA & PLANE TRIGONMETRY

1. Laws of indices, Sweds and variation, Logarithm, Properties of logarithm, use of log tables.

2. Complex numbers (addition, substraction, multiplication, division) Absolute values - Simple inequalities involving them, Conjugation.

3. A.P., G.P. and H.P, Equation involving AM, GM and HM of two positive numbers, Principles of Mathematical Induction (Statement only) and its application to the Summation of AP, GP, Squares and Cubes of Natural Numbers.

4. Quadratic Equations, inequations and Expressions, Solution of simultaneous equations in two unknowns one equation being linear and the other quadratic, both equation being quadratic (dimple cases only).

5. Determinants and Evaluation of Determinants (upto 3rd Order) as eliminants, verification of their elementary properties.

6. Permutation and Combinations, Binomial Theorem for positive integral exponent; The case for negative and fractional exponents (Statements and Application only).

7. Functions and Graphs (Function as a Correspondence between elements of two sets - no detail discussion of set theory is required. Inverse functions, Graphs and exponential and logarithmic function (Explicit definition of exponential function is not needed.

8. Measurement of angles in degrees and radians, Trigonmetrical ratios and their mutual relations. Deductions of the values of trigonmetrical ratios of specific angles like 0, 30, 45, 60,90, 120, 180 etc.

9. Definition of Circular functions and their equivalence to trigonmetrical ratios graphs of circular functions, Addition and substraction formula and deductions from them. Trigonmetrical identities, height and distance.

10. Solution of simple trigonmetrical equations, inverse trigonmetrical equations, properties of triangles, summation of series of sines and cosines of angles in AP.

Books Recommended

(1) A.R. Majumdar and P.L. Ganguli : College Algebra (Orient Book Company Calcutta)

(2) Das and Mukherjee : Intermediate Trigonmetry (U N Dhur & Son, Calcutta)

(3) Medhi & Mishra : Plane Trigonmetry (Barua Book Agency, Guwahati).

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PU COM 205(D) MATHEMATICS (II)

CALCULUS AND COORDINATE GEOMETRY

1. Functions and their graphs, Elementary ideas of Limit and continuity (vigorous definition not necessary) emphasis on geometrical description, Discontinuities should be discussed through examples of type (i) Step functions (ii)functions of type $(x^2-a^2)(x-a)$, Limit and Continuity theorems (without Proofs), Standard Limit (without proof) and simple applications.

2. Derivatives ! Evaluation of derivations of xn, Exponential and logarithmic functions from first principles, Derivative as rate measurer..

3. Fundamental rules of differentiation, chain rule, differentiation of parametric functions, logarithmic differentiation (Rules should be stated only-Emphasis on application)

4. Geometrical interpretation of derivative, targets and normals, Monotonic functions, Conditions for a function to be monotonic (statement only) Maxima and Minima (working rule)

5. Integration, Fundamental rules of integration, integration of polynomials and exponential functions, Integration by Substitution, Integration by parts, Integration by Substitution, Integration by parts, Integration of logarithmic functions and partial fractions.

6. Definite integral as the limit of a sum (only for continuous functions), Fundamental theorem of integral calculus (statement only), Evaluation of definite integrals using the above theorem.

7. Rectangular Cartesian Coordinates in a plane, Distance between points, section formula, Area of a triangle -Locus and its equation.

8. Straight lines, their standard equations, in-different forms and their applications.

9. Standard equations of circles, parabola, hyperbola and ellipses; Targents and normals to these curves (simple problems only)

10. Polar Coordinates in a plane - Their relation to Cartesian Coordinates, Equation of Straight line and Circle in polar Coordinates..

Books Recommended

(1) S.R. Maity : Elementary Course of Calculus (Ashoka Prakasan, Calcutta)

(2) R. K. Chakraborty : Coordinate Geometry

5:2:3(96/75) Annexure - 'I'

SYLLABUS FOR PRE-UNIVERSITY PSYCHOLOGY COURSE

Papers: (1) Fundamentals of Psychology - I ... 75 marks
(2) Fundamentals of Psychology - II ... 75 marks
... 50 marks
Total - 200 marks

FUNDAMENTALS OF PSYCHOLOGY - I

Unit-I

1. Historical background, definitions, branches and methods of psychology.

   (a) A brief idea of the origin and development of psychology as an independent science.

   (b) Definitions of psychology as : (i) science of coul, (ii) science of mind (iii) science of consciousness (iv) science of behaviour and experience.

   Historical development of the concepts and definition of the science of psychology.

   (c) A brief idea regarding the subject matter of some of the important branches of psychology.

   (i) Experimental Psychology (ii) Abnormal Psychology, (iii) Developmental Psychology (iv) Educational Psychology (v) Industrial Psychology and (vi) Social Psychology etc.

   (d) Methods of Psychology (i) Introspection (ii) Observation (iii) Experimental methods.

2. Psysiological Basis of Behaviour :

   (i) An elementary knowledge of functions of receptor, Effectors and Conductors.

   (ii) Structure and functions of the central Nervous system (spinal cord and Brain).

   (iii) Functions of the Autonomic Nervous system.

3. Attentional and Perceptual Processes :

   (a) Nature and kinds of attention, External and Internal determinants of attention; span of attention.

   (b) Nature and characteristics of perception; distinction from Illusion and Hallusination, perception of forms, Factors influencing perception; structural and functional.

4. Learning :

   (i) Nature and definition of learning; distinction from maturation; Fatigue and Drug

   (ii) Processes of learning - Trail and Error (Thorndike); Learning by Insight (Kohler), conditioning- (Parlov) and Instrumental (Skinner).

5:2:3(100%)

UNIT-II

5. Remembering:

(i) Process of remembering-Learning, retaining and reproducing.

(ii) Methods of reproduction - Recall, Recognition, Relearning and Reconstruction.

(iii) A brief idea about short term (STM) and long term(LTM) memory.

6. Forgetting:

(i) Nature of forgetting with reference to the contribution of Ebbinghaus.

(ii) Causes of forgetting - Time, Retroactive inhibition.

7. Thinking:

(i) Symbolic problem solving behaviour;

(ii) Distinction from imagination.

(iii) Stages of creative thinking.

Books recommended:-

1. Psychology - The fundamentals of human adjustment. Munn, Fernald and Fernald; Indian reprint; Oxford and IBH (fifth Edition).

2. Introduction to Psychology. - Morgan, King and Robinson TWH Edition, 1979.

3. Principles of General Psychology. - (Fourth Edition). Kimble, Germany and Ziegler Ronald Press Company, New York.

4. Introduction to Psychology. - Hilgard, Atkinson and Atkinson, Oxford and IBH publishing company, New Delhi.

5. Introduction to Psychology. - Garrett, Indian reprint, Oxford and IBH.

6. General Psychology - G.D. Boaz (Gaualaya, Gandhi Nagar, Madras-20

7. Understanding Psy- of human behaviour - N.C.E.R.T.

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FUNDAMENTALS OF PSYCHOLOGY - II

UNIT-I

1. Motivational and Emotional Aspects of Behaviour :

(a) Motivation:

(i) Concept, definition and scope of motivation.
(ii) Needs, Drive, Goals and Incentives.
(iii) A brief account of different types of drives- biological, social and psychological.

(b) Emotion:

(i) Concept, definition and scope of emotions.
(ii) Bodily changes and emotion.
(iii) James-Lange and Cannon- Bard theories of emotion.

2. Personality :

(i) Meaning, definition and scope of personality.
(ii) measuring personality: Questionnaire method.
(iii) Biological, social and psychological determinants of persons.

3. Intelligence and Individual Difference :

(a) Intelligence :

(i) Nature of intelligence and the concept of I.Q.
(ii) Role of heredity and environment in determining intelligence.

(b) Individual Difference :

(i) the concept of individual difference;
(ii) nature-nurture relationship:
(iii) Individual difference in intelligence.

4. Elementary Psychological Statistics:

(i) Need of statistics in psychology.
(ii) tabulation of data and frequency distribution.
(iii) graphical representation of polygon and histogram.
(iv) concept and characteristics of normal probability curve.

UNIT-II

1. Abnormal Behaviour and Mental Health:
(i) concept of abnormality.
(ii) difference between normal and abnormal behaviour.
(iii) An introduction of mental illinesses.

2. Mental Retardation:
(i) Nature and definition.
(ii) Inherited and acquired sources of mental retardation.
(iii) Rehabilitation of mentally retardation.

3. Social Behaviour:
(i) Nature and definition of social behaviour.
(ii) Social group: nature and function.
(iii) Leadership; characteristics of a leader

4. Social Attitudes:

(i) definition and scope of social attitudes.

(ii) measurement of attitude.

(a) Thurstone Method.

(b) Likert method.

Books Recommended:-

1. Abnormal Psychology - Shanmugam Tata McGraw Hill, New Delhi.
2. A text book of Abnormal Psychology. - Mohanty G.B. Kalyani Publishers, New Delhi.
3. An introduction to Social Psychology. - Kuppuswamy,(Vilks Publishing House.
4. Advanced Educational Psychology. - Chauhan (Saha Publication).
5. Statistics in Psychology and Education. - Garrett. Indian reprint(Vilks, Fetter and Simons, Bombay).
6. Psychology for human being - N.C.E.R.T., New Delhi .

PRACTICALS

At least five out of the following experiments will be conducted:

1. Span of attention for digits
2. Test of retention for meaningful and nonsense material.
3. Simple Reaction time.
4. Morror-drawing apparatus - bilateral transfer.
5. Measurement of intelligence-RCPM/RSPM.
6. Muller-Lyer illusion.
7. Personality adjustment.
8. Proposed by teacher concerned.

Books Recommended:

1. Experimental Psychology - a systematic introduction. Kothurkar and Varnarase(Wiley Eastern Limited), 1986.

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P.U. English Syllabus (Revised)

P.U. 1ST YEAR
ENGLISH 1

Time 3 Hrs Full Marks: 100

Unit I Prose

The following six pieces are prescribed from The Charm of English Prose, ed. N.K. Mishra, Madras: Macmillan (1968): = 35 Marks

1) A Football Match by John Drinkwater
2) A Call to Youth by S. Radhakrishnan
3) On Travel by Train by J. B. Priestly
4) Cigarette Picture by Robert Lynd
5) How to Write Well by C.E.M. Joad
6) My duty to My Neighbour by E. Barkey = 30 Lectures

Unit II Poetry

The following nine poems are prescribed from NEHU Anthology of English Verse: = 35 Marks

1) Fear No More by William Shakespeare
2) On His Blindness by John Milton
3) Death Be Not Proud by John Donne
4) The Poplar Field by William Cowper
5) The Little Black Boy by William Blake
6) London 1802 by William Wordsworth
7) To a Skylark by P. B. Shelley
8) On the Castle of Chillon by Lord Byron
9) La Belle Dame Sans Merci by John Keats.

= 30 Lectures

Unit III

a) Precis for 10 Marks
b) Comprehension for 10 Marks
c) Correction of Errors for 5 Marks
d) Preposition for 5 Marks

= 20 Lectures

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P.U. IIND YEAR

Time 3 Hrs Full Marks : 100

ENGLISH IIND PAPER

Unit 1 Prose

The following six pieces are prescribed from The Charm of English Prose, ed. N.K. Mishra, Madras: Macmillan (1968): 35 Marks.

1) Cricket by Neville Cardus
2) The Story of the Man in Black by Oliver Goldsmith
3) The Need for Religion by M. K. Gandhi
4) On Reading Books by Virgian Woolf
5) Science and Society by J. Bronowski
6) All about a Dog by A.G. Gardiner

= 30 Lectures

Unit II Poetry

The following ten poems from NEHU Anthology of English Verse are prescribed: 35 Marks

1) The Brook by Lord Tennyson
2) The Lost Leader by Robert Browning
3) The Soldier by Rupert Brooke
4) Where the Mind is Without Fear By R.N. Tagore
5) O Captain: My Captain by Whiteman
6) Sea Fever by John Masefield
7) The Lake Isle of Innisfree by W.B. Yeats
8) O This Island by W.H. Auden
9) How Strangely this Sun by Stephen Spender
10) The Captive Air of Chandipur-on-Sea by Jayanta Mahapatra

= 30 Lectures

Unit III Rapid Reading Section

Any one of the following prescribed Texts: 15 Marks

1) Dr. Jekyll and Mr. Hyde By R. L. Stevenson
2) Lost Horizon by James Milton
3) Animal Farm by George Orwell = 15 Lectures

Unit IV: Essay writing for 15 marks = 15 Lectures

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English (Elective) Ist Paper

Time 3 Hrs. 1st Year Full Marks : 100

Unit I

Drama for 50 Marks

1) The Merchant of Venice - William Shakespeare

2) She Stoops to Conquer - Oliver Goldsmith

Or

3) The Strife - John Galsworthy

= 35 Lectures

Unit II

One Act Plays for 50 Marks

Any four of the following from NEHU Anthology of Select One Act Plays:

1) A Pound on Demand - Sean O'Caesy

2) Under Fire - Housman

3) Hamlet' in Modern Rush - H.C.G. Stevens

4) The Ugly Duckling - A.A. Milne

5) Riders to the Sea - S.M. Synge

6) Brother Wolf - Housman

7) The End of the Beginning - O'Casey

= 35 Lectures

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IIND YEAR

IInd Paper

Time 3 Hrs Full Marks : 100

Unit I Fiction for 50 Marks

Any Two of the following :-

1. Under the Greenwood Tree - Thomas Hardy
2. Silas Marner - George Eliot
3. The Old Man and the Sea - Hemingway

= 35 Lectures

Unit II Short Stories for 50 Marks

Any four of the following from NEHU Anthology of Modern Short Stories :-

1) The Tale - Conrad
2) The Withered - Hardy
3) The Gardener - Kipling
4) The Cabuliwallah - Tagore
5) The Lady's Maid - K. Mansfield
6) An Astrologer's Dary - R.K. Narayan
7) Old Gadget - Sheila-Kaye Smith

= 35 Lectures

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P.U. Alternative English
in the 2nd Year only

Time 3 Hrs. Full Marks : 100

Unit 1 Prose

The following six pieces from English Essays, ed. Skinner and Rintoul are prescribed: 40 Marks

1. The Vision of Mirzah - Addison
2. The Man in Black - Goldsmith
3. On Being Polite - Nicholson
4. Dream Children - Charles Lamb
5. On Going a Journey - William Hazlitt
6. The Idea of Pilgrimage - Belloc

= 35 Lectures

Unit Poetry II

The following ten poems from Palgrave's Golden Treasury are prescribed: 40 Marks

1. Yarrow Unvisited - Wordsworth
2. To the Night - Shelley
3. The Terror of Death - Keaths
4. Tears Idle Tears - Tennyson
5. To Marguerite - Arnold
6. Report on Experience - Edmund Blunden
7. Pied Beauty - G. M. Hopkins
8. Above the Dock - T. E. Hulme
9. The Bat - D. H. Lawrence
10. Prayer Before Birth - Louis Macniece

= 35 Lectures

Unit III Precis writing 20 Marks

= 10 Lectures

iv) Vocationalisation of the First Degree Education - Syllabi in Industrial Chemistry, Bio-Technology and Mass-Communication-Video Production.

In consonance with the endeavour of the UGC towards the vocationalisation of the First Degree Education, the St.Anthony's College has proposed to introduce such subjects in Industrial Chemistry, Bio-Technology and Mass Communication - Video Production.

The original syllabi of the UGC are attached as Appendices 'A' 'B' 'C' and the modified syllabi made to suit the structure of the TDC of our University are at Annexure 'A' 'B' and 'C'.

It may be noted that these syllabi have been framed by the UGC after a lengthy process of consultation and study at national level and have been adopted by many Universities in the country. Further, the UGC has also recommended necessary modifications to suit local requirements.

The Academic Council may like to consider the above for approval.

5:2:4(2) Appendix - A.

SUBJECT : INDUSTRIAL CHEMISTRY
ACADEMIC PROGRAMME : B.Sc.

Sr. No	Title of the Paper	Teaching L/T Periods	P Per Week	Total Teaching Period
CORE	1st Year 1st Senester			
111	Industrial Aspects of Organic Chemistry	2		
112	Industrial Aspects of Inorganic Chemistry	2	6	12
113	Industrial Aspects of Physical Chemistry	2		
CORE	1st Year 2nd Semester			
124	Material and Energy Balance	2		
125	Unit Operation in Chemical Industry	2	6	12
126	Utilities and Fluid Flow and Heat Transport			
	2nd Year 1st Semester			
231	Material Science	2		
232	Unit Processes in Org.Chem. Manufacture - I	2	6	12
233	Unit Processes in Org.Chem. Manufacture - II	2		
	2nd 1st Semester			
244	Processes			
245	Professes			
246	Processes			
	3rd Year 1st Semester			
351	Chemical Process Economics	2		
352	Industrial Organization	2	6	12
353	Industrial Chemicsl Analysis	2		
Electives				
364/I	Pharnaceuticals - I	2		
365/I	Pharnaceuticals - II	2	6	12
366/I	Pharnaceuticals - III	2		
364/II	Heavy and Fine Chemicals - I	2		
365/II	Heavy and Fine Chemicals - II	2	6	12
366/III	Heavy and Fine Chemicals - III	2		
364/III	Petrochemicals - I	2		
365/III	Petrochemicals - II	2	6	12
366/III	Petrochemicals - III	2		

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Sr. No.	Title of the Paper	Teaching L/T Periods	P Per Week	Total Periods	Teaching Periods
364/IV	Waste Recycling - I	2			
365/IV	Waste Recycling - II	2	6	12	
366/IV	Waste Recycling - III	2			
364/V	Agrochemicals - I	2			
365/V	Agrochemicals - II	2	6	12	
366/V	Agrochemicals - III	2			
364/VI	Dyes - I	2			
365/VI	Dyes - II	2	6	12	
366/VI	Dyes - III	2			
364/VII	Polymers - I	2			
365/VII	Polymers - II	2	6	12	
366/VII	Polymers - III	2			

5:2:4(4)

JOB POTENTIAL OF VOCATIONAL PROGRAMME IN INDUSTRIAL CHEMISTRY

At present, graduates in Chemistry are being absorbed in several chemical industries as Chemists. They are not aware of the overall functioning of the industry, except sone basic knowledge of chemistry. They are given on-the-job training and nade to work as chemists.They are normally not able to rise very much in the organization. On the other hand, the graduates with Industrial Chemistry will be better suited for the job requirenents in an industrial environment. As the course covers almost all the aspects of a chemical industry, these students will be suitable for any Department in Chemical industry, like, production, Q.C., product development, effluent treatment,etc. They will be better notivated and chances of going up in the organization will be much higher. The suggested course is for the most part,general in nature, and they could be absorbed in any Chemical Industry. The Students will be able to start or be employed in village industries based on agricultural raw materials or agrobased industries such as insecticides. They will also be suitable in Technical Marketing of Produce. They can be employed by the Government in Factory Inspectorate, Pollution Control agencies and other development agencies.

There is scope for them to be employed in Banks,Financial Institutions,etc., where their experience nay be utilized in Project Appraisals for purposes of financing projects. Thus, a graduate in Industrial Chemistry will be a better notivated and more useful person in the Chemical Industries and allies Government and non-Governmental bodies. It is anticipated that there will be very good demand for these graduates.

RS/161292

NOTE ON SYLLABUS FOR INDUSTRIAL CHEMISTRY AT B.Sc. LEVEL

The practicals in Industrial Chemistry B.Sc. course can be conducted in the present Chemistry undergraduate laboratories. At present, generally 40/60 Students work in the laboratory and they are divided into two/three batches of 20 students each. The same strength may be maintained for the Ind. Chem. course. The normal reagents, chemicals and lab-wares provided to the Chemistry students are sufficient for Ind. Chem. students. Additional minor equipments required are given below semesterwise. No costly sophisticated equipments are required for the entire course.

First Year :

Semester I - No additional equipments required

Semester II- Refractometer, Tensioneter/stalgnometer, Polarimeter, visconeter (Ostwald).

Demonstration Experiments : Different types of valves, Pipe fittings, Laboratory models of filters, dryers, impellers.

Second Year :

Semester I - Colorimeter, pH meter, Potentiometer, conductometer, Dielectric Constant apparatus, Thermal conductivity measurement appratus, Thermisters, Thermocouples, Transducers.

Semester II - Ignition point apparatus, flash point apparatus, Rotameter, Nesselet tubes,

Third Year :

Semester I No additional equipments required.

Semester II Special papers.

(a) Pharmaceuticals : Microneter, Vernier, Lab. Oven for drying, Microscopes, Incubator, Autoclave, Glasswares for Microbiological testing.

(b) Heavy and Fine Chemicals : No additional equipments required.

(c) Petrochemicals :- Tensioneter, Visconeters, Rotameter, Manometer, Flash Point apparatus, Ignition Point apparatus, Pour Point apparatus, Penetrometer, Calcorimeter, Bomb Calorimeter, Oxygen cylinder.

5:2:4(6)

(d) Waste recycling : Bomb Calorimeter, COD - Incubator.

(e) Agrochemicals :- No additional equipments required.

(f) Dyes :- Lab dyeing bath, Light sources, colorimeter, Fluorineter.

(g) Polymers :- Viscometers, Dielectric constant apparatus, Tensile Strenth apparatus.

Notes : 1 Some of the above equipments are available in the Physical Chemistry Laboratory. Hence, very few additional equipments will be needed to start the course. The equipments are not very costly.

2. As the course is a vocational course, the students should make factory visits and submit the report.

3. In view of the strength of the students expected to take this course on the job training may not be possible.

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FIRST YEAR B.Sc.

Senester I

Industrial Aspects of Chemistry

Paper I

Industrial Aspects of Organic Chemistry -

IC 101 Nomenclature Generic names, Trade names

IC 102 Raw materials for organic compounds : Petroleum : Natural gas, Fractionation of crude oil, cracking, reforming, hydroforming, isomerisation. 13 L

IC 103 Coal : Types, structure, properties, distillation of Coal, Chemicals derived therefrom 8 L

IC 102 Renewable natural resources : Cellulose, Starch - Properties, modification, inportant ind. chemicals derived from them, Alcohol and alcohol based chemicals, oxalic acid, furfural 7 L

BOOKS

1. Coal Conversion, E.J.Hoffmann, The Energon Co., Lavamic, Wyoning, U.S.A.

2. Introduction to petroleum chemicals, H. Steiner, Pergamon Press

3. From Agrocarbons to petrochemicals, L.F. Hatch and S. Matarm, Gulf Publiching Co., Houston

4. Cotton-Cellulose : Its chemistry and Technologyh, Hall, A,G.

5. Methods in Carbohydrate Chemistry, Vol. 3 - Cellulose, Whistler, R.L.

6. Chemistry of Cellulose, Heuser, E.

7. Chemistry and Industry of Starch, Kerr, R.W.

8. Modifies Starches : Properties and Uses, Wurzburg O.B.

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Paper II

Industrial Aspects of Inorganic Chemistry

IC 105	Basic metallurgical operations - Pulverisation, Calcination, Roasting, Refining	5 L
IC 106	Physicochemical principles of extraction of - Iron, Copper, Lead, Silver, Sodium, Aluminum, Magnesium, Zinc, Chromium	12 L
IC 107	Inorganic materials of industrial importance - Their availability, forms, structure and modification. Alumina, Silica, Silicates, Clays, Mica, Carbon, Zeolites.	13 L

BOOKS

1. Principles of extractive metallurgy, Herbashi, Vol 1,2
2. Theory of metallurgical processes, Volsky A and Sergievskaya, E.
3. Textbook of metallurgy, Baiky A.R.
4. Clays, H.Ries, John Wileys and Sons
5. Theory of metallurgical processes, Fillipov, Mir Publication
6. Unit Processes of Extractive Metallurgty, Pehlke, Elsevier Publication
7. Industrial Chemistry, Riegel, Reinhold Publication

Paper III

Industrial Aspects of Physical Chemistry

IC 108	Surface Chemistry and Interfacial Phenomena : Adsorption isotherm, Sols, Gels, Emulsions, Microemulsions, Micelles, Aerosols, Effect of surfactants, Hydrotropes	16 L 16 L
IC 109	Catalysis : Introduction, Types - Homogeneous and Heterogeneous, Basic principles, mechanisms, Factors affecting the performance, Introduction to phase transfer catalysis, enzyme catalysed reactions - Rate model, Industrially important reactions	14 L 14 L

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BOOKS

1. Aerosol Sceince & Technology, Shepherd, H.R.
2. Catalysis : Heterogeneous and Homogeneous, Delmon, B. and Janner, G.
3. Catalysis : Science & Technology, Anderson J.
4. Catalysis in micellar and macromolecular systems Fendler J. and Fendler E.
5. Catalysis in Theory and Practice, Rideal, E.K. and Taylor, H.S.
6. Phase Transfer Catalysis, Principle and Techniques, Starles, C.
7. Surface Chemistry, J.J. Bikermann, Academic Press.
8. Physical Chemistry of Surfaces, A.W. Adanson
9. Catalysis : Heterogeneous and Homogeneous, Delmon, Elsevier Science Publisher.

PRACTICALS

1.	Simple laboratory techniques- Crystallization, fractional crystallization, Distillation, fractional distillation, boiling point diagram	10 expt.
2.	Extraction processes - Phase diagran, partition coefficient	4 expt
3.	Preparation of standard solutions - Primary and secondary standards, Determination of H_2SO_4 and H_3PO_4 in a mixture	8 expt
4.	Calibration of thermometers	2 expt.
5.	Acquantance with safely measures in a laboratory Hazards of chemicals	4 expt.

Senester II

Paper I

Material and Energy Balance

IC 110	Dimensions and units : Basic Chemical Calculations - Atomic weight, molecular weight, equivalent weitht, mole, Composition of - (i) liquid mixture, and (ii) gaseous mixtures	3 L
IC 111.	Material Balance without Chemical Reactions - Flow diagran for material balance, simple material balance, with or without recycle or by-pass for chemical engineering operations such as distillation , absorption, crystallisation, evaporation, extraction, etc.	9 L

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IC 112 Material Balance involving chemical Reaction - 9L

Concept of limiting reactant, conversion, yield, Liquid phase reaction, gas phase reactions, with/without recycle or by-pass.

IC 113 Energy Balance- Heat capacity of pure gases and gaseous mixtures at constant pressures. Sensible heat changes in luquids, Enthalpy changes 9 L

BOOKS

1. Stoichiometry, B.I. Bhatt and S.M. Vora
   Tata McGraw-Hill Publishing Company Ltd., New Delhi.

2. Chemical Process Principals - Part one,
   O.A. Hougen, K.M. Watson, R.A. Ragatz
   Asia Publising House, Bombay.

Paper II

Unit Operations in Chemical Industry

IC 114 Distillation - Introduction; Batch and continuous distillation, Separation of azeotropes, Plate columns and packed columns. 5 L

Absorption - Introduction; Equipments - packed columns, spray columns, bubble columns packed bubble columns, mechanically agitated contactors. 4 L

IC 115 Evaporation - Introduction; Equipments - short tube (standard) evaporator, forced circulation evaporators, falling film evaporators, clibing film(upward flow) evaporators, wiped(agitated) film evaporator. 4 L

Filtration - Introduction; Filter media and filter aids, Equipments - plate and frame filter press, nutch filter, rotary drum filter, sparkler filter, candle filter, bag filter, centrifuge. 4 L

Drying - Introduction; Free moisture, bound moisture, drying curve; Equipments - tray dryer, rotary dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer. 4 L

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IC 116 Crystalization - Introduction: solubility, supersaturation, nucleation, crystal growth; Equipment - tank crystallizer, agitated crystallizer, evaporator crystallizer, draft tube crystallizer. 9 L

IC 117 Extraction - Introduction: selection of solvents; Equipments - spray column, packed column, rotating disc column, mixer-settler. 3 L

Mixing - Introduction; mixing of liquid-liquid, solid-solid, liquid-solid systems. 2 L

BOOKS

1. Introduction to Chemical Engineering, W.L. Badger and J.T. Banchero McGraw-Hill Book Co. U.S.A.

2. Unit Operations in Chemical Engineering W.L. McCabe and J.C. Smith McGraw-Hill Book Company, New York.

3. Chemical Engineers' Handbook J.H.Perry, McGraw-Hill Book Co., New York

4. Unit Operations- I and II D.D. Kale Pune Vidyarthi Griha Prakashan, Pune.

Paper III

Utilities and Fluid Flow and Heat Transport in Industry

Utilities in Chemical Industry

Fuel - Types of fuels - Advantages and disadvantageds combustion of fuels, calorific value. Specifications for fuel oil

Boilers - Types of boilers and their functioning water - Specifications for industrial use, various water treatments.

Steam - Generation and use

Air - Specifications for industrial use Processing of air.

IC 119 Fluid Flow : Fans, blowers, compressors, vacuum pumps, ejector 4 L

Pumps : Reciprocating pumps, Gear pumps, Centrifugal pumps. 4 L

5:2:4(12)

Heat Transfer : Heat Exchangers - Shell and Tube type; finned tube heat exchangers, plate heat exchangers, refrigeration cycles 7 L

BOOKS

1. Introduction to Chemical Engineering, W.L. Badger and J.T. Banchero McGraw-Hill Book Co. U.S.A.
2. Unit Operations in Chemical Engineering W.L. McCabe and J.C. Smith McGraw-Hill Book Company, New York
3. Chemical Engineers' Handbook J.H.Perry, McGraw-Hill Book Co.,New York
4. Unit Operations- I and II D.D.Kale Pune Vidyarthi Griha Prakashan, Pune
5. Standard Handbook of Plant Engineering Editors; R.C. Rosaler and J.O. Rice Mcgraw Hill Book Co., New York.

Practicals

1. Depression and elevation in b.p./m.p. of solids and liquids.
2. Chromatography - Column, paper, Thin layer
3. Ore analysis- Dolomite, limestone, calcite Analysis of alloys such as cupro-nickel
4. Determination of physical constants -

   Refractive index, surface tension, (Effect of surfactants on surface tension, viscosity - Fluids, polymer solutions, effect of additives on viscocity, optical rotation.
5. Study experiments/demonstration experiments

SECOND YEAR B.Sc.

Semester I

Paper - I

Material Science

IC 201 Mechanical properties of materials and change with respect to temperature. 2 L

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Materials of constructions used in Industry

Metals and Alloys - Important metals and alloys; iron, coppor, aluminuim leqd, nickel, titanium and their alloys - Mechanical and chemical properties and their applications. 6 L

Cement - Types of cement, Composition, Manufacturing process, setting of cement. 4 L

Ceramics - Introduction, Types, Manufacturing processes, Application, Refractories. 4 L

Polymeric materials : Industrial polymer and composite materials - Their constitution, Chemical and physical properties, Industrial applications. 6 L

Glass - Types, composition, Manufacture, Physical and Chemical properties, Applications. 4 L

Corrosion - Various thpes of corrosion relevant to chemical industry - Mechanism, Preventive methods. 4 L

BOOKS

1. Science of Ceramics Chemical processing, Hench, L.L.
2. Chemistry and Physicsw of Clays other ceramics
3. Science of ceramics, Stewart, G.H.
4. Chemistry of cement.
5. Properties of glass, Morey, G.W.
6. Chemistry of glasses, Paul, A.
7. Corrosion : Causes and prevention, Spellur, F.N.
8. Corrosion and Corrosion engineering Fontana M.G. and Green N.D., Mc Graw-Hill Book co.
9. Experiments in Materials Technology, a Laboratory Text for Engineers, Manufacruting metallurgy and materials testing, Govt. of India; East West Publication.
10. Selecting Materials for Process Equipment Mc Maughton K.J., Mc Graw - Hill Book Co.

5:2:4(14)

Paper II

Unit processes in organic chemicals manufacture -I

IC 203 Nitration : Introduction - Nitrating agents, Kinetics and mechanism of nitration processes such as nitration of : 12 L

i) Paraffinic hydrocarbons

ii) Benzene to nitrobenzene and m-dinitrobenzene

iii) Chlorobenzene to o- and p- nitrochloro benzenes

iv) Acetanilide to p-nitroacetanilide

v) Toluene

Continuous vs batch nitration

IC 204 Halogenation : Introduction - Kinetics of halogenation reactions, Reagents for halogenation, Halogenation of aromatics + side chain and nuclear halogenations, Commercial manufactures - chlorobenzenes, chloral, monochloracetic and chloromethanes, dichlorofluoromethane. 9 L

IC 205 Sulphonation : Introduction - sulphonating agents, Chemical and physical factors in sulphonation, Kinetics and mechanism of sulphonation reaction, Commercial sulfonation of benzene, napthalene, alkyl benzene, Batch vs continuous sulphonation. 9 L

BOOKS

1. Unit Process in Organic Synthesis
P.M. Groggins, McGraw-Hill Book Co., New York

Paper III

Unit Processes in Organic Chemicals Manufacture-II

IC 206 Oxidation : Introduction - Types of oxidation reactions, Oxidizing agents, Kinetics and mechanism of oxidation of organic compounds Liquidphase oxidation, Vapor phase oxidation, Commercial manufacture of benzoic acid maleic anhydride, phtalic anhydride, acrolein, acetaldhyde, acetic acid. 7 L

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IC 207 Hydrogenation : Introduction - Kinetics and thermodynamics of hydrogenation reactions, Catalysts for hydrogenation reactions, Hydrogenation of vegetable oil, Manufacture of methanol from carbon monoxide and hydrogen, hydrogenation of acids and esters to alcohols, catalytic reforming. 7 L

IC 208 Alkylation : Introduction : Types of alkyation, Alkylating agents, Thermodynamics and mechanism of alkylation reactions, Manufacture of-alkyl benzenes (for detergent manufactire), ethyl benzene, phenyl ethyl alcohol, N-alkyl anilines (mono and di-methyl and ethyl anilines) 7 L

Esterification : Introduction; Hydrodynamics and Kinetics of esterification reactions, Esterification by organic acids, by addition of unsaturated compounds, esterification of carboxy acid derivaives, commercial manufacture of-ethyl acetate, dioctyl phtahlate, vinyl acetate, cellulose acetate.

IC 209 Amination :(A)BY reduction : Introduction, Methods of reduction-metal and acid, catalytic, sulfide, electrolytic, metal and alkali sulfites, metal hydrides, sodium metal, concentrated caustic oxidation, reduction, commercial manufacture of aniline, m-nitroaniline, p-amino phenol . 7 L

(B) aminolysis : Introduction, aminating agents, factors affecting.

Hydrolysis : Introduction; hydrolysing agents, kinetics, thermodyanics and mechanism of hydrolysis.

BOOKS

1. Unit Processes in organic synthesis, P.H.Groggins, McGraw-Hill Book Co., New York.

Practicals

Unit process: One to two examples of each of the following unit processes.

Nitration, sulphonation, Friedel-crafts reaction, esterification, Hydrolysis, oxidation, Halogenation, chlorosulphonation, Reduction, polymerization, reactions of diazonium salts.

.....

5:2:4(16)

Instrumental methods of analysis - use of colourimeter, pH meter, potentiometer, conductometer, refractometer, polarimeter

Material testing : Testing of alloys Identification of plastics/rubber Estination of yield point, Young's modulus, flaredness; Optical, thermal mechanical and electrical properties.

Process Instrumentation - transucers of different types.

5:2:4 (17)

Semester II

Paper I

POLLUTION

IC 210	Air, Oxygen, nitrogen cycle, water, Biosphere, Flora and fauna, Energy, Soil.	8 L
IC 211	Pollutants and their statutory limits. Pollution evaluation methods.	7 L
IC 212	Air pollution-various pollutants. Water pollution-Organic/inorganic pollutants. Noise pollution Sewage analysis Pesticide pollution Radiation pollution, Green house effect, Future.	15 L

BOOKS

1. Pollution control in chemical and allies industries, Mahajan S.P.

2. Pollution control in industries. A series of books by Jones H.R.

3. Systen's Approach to Air Pollution Control, R.J. Bibbero and I.G. Young

4. Air Pollution-Vol. I-IV Editor, A.C. Stern, Academic Press, New York

5. Gas Purification Process for Air Pollution Control, G. Nonhebel Newnes-Butterworths, London

6. Air Pollution Technology, Painter D.E., Reston Publishing Co.

Paper II

Effluent Treatment and Waste Management

IC 213	Principles and equipments for aerobic, anaerobic treatment, adsorption, filtration, sedimentation.	10 L
	Bag filters, electrostatic precipitator, mist eliminators, wet scrubbers	8 L
	Absorbers	4 L
	Solid waste management	4 L
	Industrial safety	4 L

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BOOKS

1. Effluent Treatment in Process Industries - Inst. of Chen.Engg

2. Effluent Treatment and Waste disposal - Inst. of Chen.Engg.

3. Effluent treatment and disposal Inst. of Chen.Engg.

4. System's Approach to Air Pollution Control, R.J. Bibbero and I.G.Young

5. Air Pollution-Vol. I-IV Editor, A.C. Stern, Academic Press, New York

6. Gas Purification Process for Air Pollution Control, G. Nonhebel Newnes-Butterworths, London

7. Air Pollution Technology, Painter D.E., Reston Publishing Co.

Paper III

Process Instrumentation

Concept of measurement and accuracy	2 L
Principle, construction and working of following measuring instruments	
Tenperature - glass thernometers, bimetallic thernometer pressure spring thernometer, vapour filled thermometers resistance thernometers. radiation pyrometers	10 L
Pressure - Manometers, barometers, bourdon pressure gauge; bellow type, diaphragn type pressure gauges, macleod gauges, Pirani gauges, etc.	7 L
Liquid level : Direct - indirect liquid level measurement, Float type liquid level gauge, ulltrasonic level gauges ; bubbler system	8 L
Density measurement	2 L
Viscocity measurement	2 L

5:2:4(19)

BOOKS

1. Industrial instrumentation
   D.P. Ecknan, John-Wileys & Sons

2. Applies Instrumentation in Procedss Industries, Vol. I, II & III W.G. Andrews, Gulf Publication

3. Instrumentation and Control for the process industries.

   S. Borer, Elsevier Applied Science publishers.

4. Chemical Engineers' andbook. J.H. Perry and D Greenb, McGFraw-Hill Publishing Co,, New York.

Practicals

Semester

1. Use of Transducers for measuring flow control

2. Determination of Flash point and ignition points of liquids

3. Water analysis - Solid content, Hardness, COD, and other tests as per industrial specifications

4. Flow measuring devices - floats

5. Monographs of representative raw materials such as sulphuric acid, toluene, sodium, carbonate, sodium hyroxide, carbon tetrachloride Benzoic acid. (5-6 compounds)

6. Limit tests for heavy metals pb,As, Hg, Fe and ash content.

THIRD YEAR B.Sc.

Semester I

Paper I

Chemical process Economics

IC 301	Factors involved in project cost estimation, Methods employed for the estination of capital inv@stment.	6 L
	Capital formation. Elements of cost accounting.	5 L
	Interest and investment costs, Time value of money-equivalence.	3 L
	Depreciation, methods of determining depreciation, Taxes.	4 L
	Some aspects of marketing, Pricing Policy.	4 L
	Profitability criteria, Economics of selecting alternatives.	3 L
	Variation of cost with capacity, Break-even Point. Optimum batch sizes, production scheduling, etc.	5 L

5:2:4(20)

BOOKS

1. Economics of Chemical Industry, Henpel. E.H.

Paper II

Industrial Organisation

IC 302 Concept of scientific management in Industry ;	4 L
Functions of management, decision making, planning, organising, directing and control ;	9 L
Location of Industry ;	3 L
Materials management,	5 L
Inventory control ;	4 L
Management of human resources-selection, incentives welfare and safety.	5 L

BOOK

1. Industrial Organization and management, Bethel L.L.

Paper III

Industrial Chemical Analysis

Industrial Analysis

Sampling procedures, sampling of bulks materials, Techniques of sampling solids, liquids and gases	3 L
collecting and processing of data	2 L
Chromatography, paper chromatography, TLC, GLC, HPLC	4 L
Particle size determination	2 L
Rheological properties of liquids, plastics and their analysis	3 L
Modern instrumental methods of analysis	3 L
UV - visible spectrosopy	3 L
IR - spectroscopy and non-dispersive IR	3 L
NMR - spectroscopy	3 L
Atomic Absorption, Flame photometry	
Neutron diffraction	1 L
X-ray fluoroscence	1 L
Ion - selective electrodes	1 L
Ion - chromatography	1 L

5:2:4(21)

BOOKS

1. Instrumental methods of chemical analysis, Willard, Merrit, Dean, Settal .

2. Introduction to instrumental analysis - Braun R.D., Mc Graw, Hill Publishing Co.

3. Rheology theory and application, Vol.5, Elrich, R.F.

4. Analytical Chemistry, J.G. Dick, McGraw, Hill Publication Co.

5. Quantitative Inorganic Analysis, A. Vogel, Langman Publication.

6. Instrumental Methods of Analysis, Skoog and West.

Practicals

1. Industrial Analysis - Analysis of common raw materials as per the industrial specifications, such as phenol, aniline, formaldehyde, hydrogen peroxide, acetone, epoxide, olefins, oils, etc. 10 expts

2. Synthesis of common industrial compounds involving two step reactions - for example 4-Bromoaniline, 3-nitroaniline, sulphanilamide 4-Aminobensoic acid, 4-nitrobenzoic acid, Dihalobenzenes, Nitrohalobensenes 20 expts.

Semester II Elective subjects

PHARMACEUTICALS

Paper I

Historical background and development of pharmaceutical industry in India in brief. 2 L

Pharmacopoeias - Development of Indian Pharmacopoeia and introduction to B.P., U.S.P., E.P., N.F. and other important pharmacopoeias. 2 L

Introduction to varoius types of formulations and roots of administration. 2 L

Aseptic conditions, need for sterlisation, various methods of sterilisation. 2 L

Various types of pharmaceutical exipients - their chemistry, process of manufacture and quality, specifications - Glidants , lubricants, diluents, preservatives, antioxidants, emulsifying agents, coating agents, binders, colouring agents. flavouring agents, gelatin and other additives, sorbitol, mannitol, viscosity builders, etc. 12 L

Surgical dressings, sutures, ligatures- with respect to the process, equipments used for manufacture, method of sterlization and quality control. 5 L

5:2:4(22)

Pharnaceutical packaging - Introduction, package selection, packaging materials, ancillary materials, packaging machinery - quality control of packaging materials. 5 L

Paper II

FDA, Important schedules and some legal aspects of drugs. 3 L

Phytochemicals-Introduction to plant classification and crude drugs, cultivation, collection, preparation for the market and storage of medicinal plants 3 L

Evaluation of crude drugs-moisture content, Extractive value, volatile oil content, foreign organic matter. Quantitative microscopic excercises, including of starch, leaf content (Palisade ratic, stomatal number) crude fibre content. introduction to chromatographic method of identification crude drugs. 6 L

Chemical constitution of plants - Including carbohydrates, amino acids, proteins, fats, waxes, volatile oils, terpenoids, steriods, saponins, flavonoids, tannins, glycosides, alkaloids. 9 L

Various isolation procedures for active ingradients with exanple for alkaloid, e.g., vincaalkaloids, reserpine; one for steroids - sapogenin, diosgenin, diagroh. 3 L

Pharmaceutical quality control (other than the analytical methods covered under core subject)-sterility testing, pyrogenic testing, glass testing, bulk density of powders, etc. 6 L

Paper III

Classification of various types of drugs with examples. 15 L

Raw materials, process of manufacture, effluent handling, etc, of the following bulk drugs

(i) Sulpha drugs - sulphaguandine, sulphanethoxazole

(ii) Antimicrobial - chloramphenicol, furazolidine, mercurochrone, isoniazid, Na-PAS.

(iii) Antalgesic-antiinflammatory-salicylic acid and its derivatives, Iuprofen, nefenamic acid.

(iv) Steroidal hormones - progesterone, testoserone, methyl testosterore.

(v) Vitamins - Vit. A, Vit. B6, Vit.C

(vi) Barbiturates- Pentobarbital

(vii) Blockers-Propranolol, atenolol

(viii) Cardiovascular agent- Methyl dopa

(ix) Antihistamines- Chloropheneramine meleate.

Products based on formentation processes - 15 L
Brief idea of microorganisms, their structure, growth and usefulness. Enzyme systems useful for transformation, microbial products.

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General principle of fermentation processes and product processing.

Manufacture of antibiotics - Penicillin - G and semisynthetic penicillins, Rifamycin, tetracyclins, vit. B 12

Biotransformation processes for prednisolone, 11-hydroxylation in steroids.

Enzyme catalyzed transformation, manufacture of ephidrine.

Practicals

1. Demonstration of various pharmaceutical packaging materials, Quality control tests of some materials - Aluminium strips, cartons, glass bottles. 4 expt

2. Limit tests for chlorine, heavy metals, arsenic, etc. of two representative bulk drugs. 3 expt

3. Demontration of various pharmaceutical products 7 expt

Active ingradient analysis of few types of formalations representing different methods of analysis - Acidimetry, alkalimetry, nonaqueous complexometry, etc.

Determination of sulphate ash, loss on drying, and other tests of bulk drugs, complete I.P. monograph of three drugs representing variety of testing methods. 5 expt

Evaluation of crude drugs - Microscopic examination- Determination and indentification of starch grannules, calcium oxalate. 7 expt

Palisate ratio, stomatal index determination Identification of few drugs. TLC method for identification.

Microbiological testing - Determination of MIC of some antibacterial drugs by zone/cup plate method. 4 expt

Books

1. Practical pharmacognosy
   by T.B, Wllis,
   Practical pharmacognosy, by T.N.vassudevan,
2. Moden pharmacognosy
   by Ramstad; McGraw Hill
3. Indian pharmacopoea 1985
4. British pharmacopoea 1990
   Hond Book of Drugs and Cosmetic Acts
   By Mehrotra
5. Pharmaceutical Excipients.
6. Pharmaceutical Dosage forms
7. Principles of Medicinal Chemistry, W.O Foye; Lea and Febigen, Publication, Philadephia.
8. Text book of organic Medicinal and Pharmaceutical Chemistry Wilson, Gisvold, Derge; Lippinett-Toppan.
9. Esssentials of Medicinal chemistry - Korolkovas and Burkhatter, Wiley-Interscience.

5:2:4(24)

10. Organic Chemistry of Drug Synthesis, Daniel Lednice & L.A. Mitscher. Wiley Interscience.

11. An Introduction to synthetic Drugs, P.P. singh and D.W. Rangnekar, Himalaya Publication, Bombay.

HEAVY AND FINE CHEMICALS

Paper I

Heavy Inorganic chemicals

Manufacture of the following with reference to (i) consumption pattern 'ii) Raw materials (iii) Production process (iv) Major engineering aspects (v) Special material of constructions (vi) Quality control (vii) Hazards and safety (viii) Effluent management.

Synthetic nitrogen products - Ammonia, nitric acid, ammonium nitrate and ammonium sulphate — 4 L

Chlor-alkali industrial products - Caustic soda, — 3 L

Phosphorus chemicals - Phosphorus, phosphoric acid, ammonium phosphate, superphosphate, triple superphosphate. — 3 L

Industrial carbon - carbon blacks, manufactuer of graphite, and carbon. — 2 L

Lime, gypsom,

Silicon, calcium carbide, silicon carbide — 2 L

Fluorine, Bromine, Iodine, hydrobromic acid, interhalogen compounds. — 4 L

Sodium chloride, sodium sulphate, sodium sulphite, sodium thiosulphate, borax, boric acid. — 5 L

Industrial catalysts - Raney nickel, other forms of nickel, palladium and supported palladium, copper chromate, vanadium, and platinum based catalyst. — 3 L

Aluminium alkoxides, titanium tetrachloride, and titanates, titanium dioxide. — 2 L

Paper II

Heavy Organic Chemicals

Manufacture of the following with reference to - (i) Raw materials (ii) Flow chart (iii) Effluent managements (iv) Kinetics (v) Uses -

Fischer - Tropsch Synthesis - Examples — 2 L

Applications and uses of zeolites as catalyst. Their use in isomerization and dehydration/dehydroxyllation. — 2 L

Chemicals derived from acetylene - Acetylene, propargyl alcohol, 1,4-butene diol, acrylates, vinylesters, vinyl chloride. — 4 L

Pyridine, picolines, phenol, acetone, resorcinal, phthalic anhydride. — 3 L

Glycerol, sorbitol, melamine, formaldehyde, formic acid — 3 L

Triphenyl phosphine, alkyl phosphates chlorination of methane- to methyl chloride, dichloromethans, chloroform, carbon tetrachloride. — 2 L

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Ethanolamine, mono-, di-, tri-, ethanolamine, Dialkyl aminoethanols (dimethyl, diethyl).	3 L
Alkyamines - Methylamine, ethylamine, di-, tri- alkylamines ($_m$ethyl,ethyl), butyl amines, propyl amines.	3 L
Ketene, ethyl and methyl acetoacetates.	1 L
Acetaldehyde, paraldehyde	1 L
Speciality industrial solvents - DMF, DMSO, Sulpholane, alkylpyrrolidone, THF, dibutyl ether, diethyl ether, diglyme, dimethoxy ethane, dioxane.	1 L

Paper III

Fine and Speciality Chemicals

Reagents - Laboratory chemicals from heavy chemical industry in required purity-Acids, alkalis, carbonates, drying agents; Analytical reagents - Sodium carbonate, sodium bicarbonate, potassium dichromate, oxalic acid, perchloric acid, Common solutions -Fehling solution, Karl-fisher reagent.	2 L
Chromatographic materials and HPLC solvents - Coating material, precoating of plates, Spectroscopy grade chemicals - Methanol, ethanol, potassium bromide, carbon tetrachloride, nujol, chloroform.	3 L
Biochemical reagents - Ninhydrin, tetrazolium blue, 1,2-naphtnaquinone-4-sulphonate.	1 L
Manufacture of following fine chemicals with reference to (1) Raw material of common industrial compound involving two step reactions - for example 4- Bromoaniline, 3-nitroaniline, sulpterial (ii) Production process (iii) Special material of construction (iv) Hazard and safety (v) Effluent management (vi) Quality control (vii) Specifications:	2 L
Sodium borohydrate, lithium aluminium hydride sodium amide, sodium ethoxide, sodium methoixde.	2 L
Paracetamol,	2 L
Indigo, Vat dyes, Reactive dyes	2 L
Essential oils - general, organic flavour, comphor, citral, citronellol, menthol	3 L
Surfactants and emulsifying agents - PEG, Tweens, Spans.	2 L
Colouring agents - Manufacture of some natural colours and -synthetic colours	2 L
Flavouring agents - Fragrances and Food additives.	3 L
Natural tartaric acid, (+) tartaric acid Resolution of tartaric acid	2 L
Citric acid	1 L
Chemicals required for electronic industry	1 L

Practicals

Preparation of Raney-Nickel from Ni-Al alloys and testing its properties.	1
Any one reaction using the above catalyst.	1
Preparation of synthetic zeolites.	2

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Reactions using zeolites. 2

Preparation of aluminium isopropoxide and reactions using the same. 4

Synthesis of trimethyl phosphate and related reagents - Applications of this for O-alkylation and N-alkylation. 4

Preparation of reagent grade chemicals- Sodium carbonate 6

Sulphuric acid, etc., solvents, etc.

Synthesis of few fine chemicals- For example,
Amyl acetate, flavour chemicals
Paracetamol, sulphanimalide.
Purification of lemon grass oil to obtain citral.
Resolution of tartaric acid and -phenyl ethyl amine. 6

Isolation of some natural products, like tartaric acid, citric acid, etc. 4

BOOKS

1. Chemical Process Industries, Shreve R.N., McGraw Hill Book Co., New York.

2. Applied Organic Chemistry, Kilner E.and Samuel, D.M. MacDonald & Evans Ltd., Londoaguandine, sulpha methoxazol Antimicrobial - chloramphenicol, furazolidine, isoniazid, Na- PASn, 1960.

3. Introduction to Material Science and Engineering, K.M. Rells, T.Courtney and J.Wulff, Wiley Eastern Pvt.Ltd.New Delhi.

4. Unit Process in Organic Synthesis, P.H.Groggins, McGraw-Hill Kogaknsha Ltd.

5. Outline of Chemical Technology, C.E. Dryden East West Press, New Delhi.

6. Industrial Chemicals, Faith et.al. Wiley Interscience, New York.

7. Heavy Organic Chemicals, A.J.Gaite, Pargmon Press., U.K.

8. Chemicals from Petroleum, Waddams, ELBS and John Marray, 1970.

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9. Speciality Inorganic Chemicals, R. Thomson Royal Society of Chemistry, Burlington, U.K.

PETROCHEMICALS

Paper I

Introduction to crude oil, exploratory methods oil reservoirs, transportation of crude oil, Constitution of crude oil. Natural gas - constituents. — 6 L

Distillation of crude oil, Separation of natural gas and different fractions based on relative volatilities. Compositions of different distillates — 3 L

Meaning of term such as - pour point depressants, drag reducers, viscocity reducers, ignition point, flash point, octane number, doctor solution. — 4 L

Types of hydrocarbon fuels and their charactristics — 2 L

Detailed discussion of the following operations with respect to process, mechanism, catalysts used and applications : Cracking - Catalytic Cracking, Hydrocracking, Isomerization, Reforming, Isomerization, Alkylation. — 15 L

Paper II

Sulphur, hydrogen, petroleum coke and nitrogen compounds from petroleum. — 4 L

General discussion of the following reactions with respect to mechanism and applications - oxidation, ammonidation, hydro-formylation, hydration. — 4 L

Manufacture of the following compounds : Methane, ethylene, acetylene, propylene, C-4 hydrocarbons, higher olefins. — 6 L

Preparation of the following from methane-Methanol, carbon black, hydrogen cyanide, chlorinated methanes, carbon disulphidez. — 7 L

Preparation of the following from ethylene-Ethyl chloride, ethanol, ethylene oxide, ethylene glycol, acetaldehyde, acetic acid, styrene, vinyl acetate, ethanolamines, vinyl chloride, acrylonitrile. — 9 L

Paper III

Manufacture of the following from propylene : Isopropanol, cumene, glycerine, acrylonitrile — 3 L

Manufacture of the following from acetylene : vinyl chloride, chloroprene, acrylonitrile, acetaldehyde. — 3 L

Manufacture of the following from C-4 hydrocarbons : Butadience, isobutene, isobutane, butanediols, oligomers. — 3 L

Manufacture of aromatic compounds - Benzene, toluene, xylenes, naphthalene, linear alkyl benzenes — 4 L

and their sulphonates, detergents.

Various catalysts used in petrochemical industry, Preparation, structure, applications and selectivity. 6 L

Importance of petroleum and petroleum industry in the context of Indian economy. 4 L

Indian petrochemical Industry - Indian reserves, quality and petroleum distribution. Future 4 L

Books

1. Handbook of petroleum refining process. R.A.Mayers, Mcgrow Hill. Book Comp. New York.
2. From Hydrocarbone to Petrochemicals, L.F. Hatch and S. Mater. Gulf Publishing Company , Houston.
3. Petrochemicals - The vise of an industry, Spitz, Wiley.
4. Introduction to Petroleum Chemicals, H.Steiner, Pergaman Press.
5. Catalysts in Petrochemical refining, Trimm.

Practicals

Viscocity - Viscocity of hydrocarbons and hydrocarbon mixture, Effect of Viscocity reducers

Surface tension - Surface tension of different liquids, effect of surfactants.

Flow measurement in pipes of different materials - effect of drag reducers.

Measurement of flash point, ignition points pour point - effect of pour point depressants.

Determination of calorific value of fuels

Preparation of a few catalysts used in petrochemical industry, like doped silica gel, aluminas, treatment of silica gel and alumina with acids.

Characterization of coke.

Characterization of bitumen

Characterization of petrol, kerosene, diesel, furnace oil, with respect of flash point, viscocity, surface tension, composition, distillation fractions.
Hydration of olefins - styrene

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Dehydration of alcohols - tert- butanol
Sulphonation of aromatics and preparation of the sodium salt of the sulphonic acid as a detergent.

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WASTE RECYCLING

Paper I

Need for waste recycle : Limitations of raw material resources, waste elimination
Conversion of waste into useful products — 4 L

Identification and quanlification of industrial, domestic and agro waste. — 4 L

Feasibility of recycle. Separation of wastes - solid, liquid, gaseous.

Solid Wastes - Removal of solid contaminants from water by coagulation, sedimentation, flocculation, solid waste disposal, incineration, fuel palletization, soil conditioning. — 10 L

Water management : Waste water treatment. Biological, physical and chemical treatments. Treatment of water and its reuse in industries, agriculture, oil refineries thermal power station and domestic uses.
Reuse of cooling water. — 12 L

Paper II

Physical and chemical processes used for the recovery of important compounds from wastes — 16 L

Activated carbon adsorption, ion exchange process, evaporation, extraction, distillation, contrifugation, filtration, coagulation, membrane processes - osmosis, reverse osmosis, electrodialysis, pervaporation, freezing processes.

Biological processes for the treatment of waste water : — 4 L

Trickle filters, activated sludge process, microbial degradations.

Gaseous wastes : Adsopption, catalytic/non-catalytic conversion, recovery of important gases, CO_2, SO_2, NO_x, etc., Electrostatic precipitation, bag filters, wet/dry grid arrestors. — 10 L

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Paper III

Characterization of wastes, their management and recovery of importaant compounds from the wastes from the following Industries : 28 L

Dyestuff, Fertilizers, Textile, oil, fats and soap, iron and steel plants, tanneries, slaughter houses, rubber, sugar, heavy chemicals, fermentation, thermal power stations, electroplating, paper, paint.

Economics of recycling of waste 2 L

BOOKS

To be suggested

Practicals

Estimations, of SO_2, NH_3, NO_x

Estimation of hardness, acidity, alkalinity and pH of water

Estimation of BOC, COD content of effluent water from different industries.

Analysis of the solid contents from the liquid effluent from different industries, separation of the constituents, chromatographic separation - TLC, paper chromatography.

Ion exchangers . Ion exchange capacity of resins, softening of hard water, separation of important metals, Fe, Ni, Cr from the effluents and their estimations.

Activated carbon -

Efficiency of carbon, adsorption isotherms, separation of some important chemicals by adsorption on carbon.

Fuel pallets from garbage and solid wastes. Calorific value

The students are expected to collect solid and liquid wastes from nearby industries and analyse with respect to constituents, recovery of important constituents and disposal methods.

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AGROCHEMICALS

Paper I

Pests and pest control, Types of pests, Types of chemicals used to control pests. 4 L

Types of pesticides - Stomach poison, contact poisons systemic poisons, fumigants.

Insecticides :

Inorganic insecticides - Arsenic insecticides, paris green, fluoro insecticides 3 L

Insecticides of plant origin - Nicotine, nornicotine, pyrethroids, rotenoids, anabasin, allethrin. 4 L

Chlorinated hydrocarbons - DDT, DDD, nestran, dilan, perthane, dimite, chlorobenzilate, sulphenex, ovotran, aramite, DFDT. SAR in the class and mode of action. 10 L

BHC, chlordane, heptachlor, aldrin, dieldrin, endrin, faodrin, endosulfan, SAR in the class and mode of action. 9 L

Paper II

Organophosphorus insecticides :

Introduction, Phosphoric acid derivatives - Dimecron, dichlorovos, naled, phosphinon, etc. SAR in the class. 4 L

Dithiophosphonic acid derivatives - Melathion, dimethoate, thiocron, formothion, mecarbam, etc. 6 L

Thiophosphoric acid - Parathion, methyl parathion, thiophos, demetron, chlorthion, paraoxon, etc. 5 L

Pyrophosphoric acid derivatives - TEPP, sulfotepp, schradan 4 L

Other organophosphorus, insecticides - Isopestox trichlorofon, IPN. 4 L

Carbamate insecticides - Carbaryl, isolan, mesurol, zectran, demetram, pyrolan, baygon, mode of action. 6 L

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Paper III

Fungicides - General Introduction 1 L

Inorganic fungicides -

Sulphur, Lime sulphur, copper sulphate, Bordeaux mixture, Bordeaux paste, Bordeaux paint, Burgandy mixture, copper oxychloride, cuprous oxide, mercurous chloride. 4 L

Organomercuric compounds - Ethyl mercuric chloride, ceresan-M, panogen, agaloi, uspulan, puratized, germisan, Mode of action, agrosan GN 2 L

Dithiocarbamates - Ziram, ferbam, thiram, nabam, zineb, maneb, captan, hinosan, vapam etc., Mode of action. 5 L

Miscellaneous fungicides - Dithanon, dichlone, captan, polpet, difolatan, mesultan, brestan, dodine, glyodin, methyrimol, terrazole. 3 L

Herbicides - Introduction : 2, 4-D; 2,4-DB; 2, 4-DES; MCPB; 2,4,5-T, Monujron, Fenuron, TCA, paraquat. 3 L

Fumigants - HCN, CS_2, ethylene halides, durofume methyl halides 2 L

Rodenticides - Zice phosphide, warfarin 3 L

Nematicides - DD mixture, aldicarb, fensulfothion.

Plant growth regulators : Introduction, gibberilic acids indole acetic and butyric acids 4 L

Naphthalene acetic acid, cycocil. Moderof action.

Formulations of pesticides - Dry formulations - Dusts, grannules, wettable powders, seed disinfectants. Liquid formulations - Emulsions, suspensions, etc. Aerosols and sprays 3 L

Practicals

Isolation of nicotine from tobacco leaves/waste

Preparation of copper sulphate, Estimation of copper in copper sulphate formulations, Formulations of copper sulphate.

Estimation of arsenic in arsenic insecticides.

Isolation and estimation of active ingradients of commercially available insecticide formulations.

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Preparation of selected pesticide formulations in the form of dusts, emulsions, sprays.

Estimation of pesticide residues in food a-rticles .

Study of the degration of pesticides in soil in the presence of sunlight and moisture. Determination of pesticides contents in the soil.

Effect of plant growth regulators on the development of plants and fruits.

Books

1. Pesticides - Colour publications, P.L. Bombay

2. Elements of plant protection - L.L. Pyenson. John Wiley & Sons

3. Insecticides : Action and Metabolism -O'Brien R.D Academic Press, New York

4. Fungicides in plant disease control, Y.L. Nene, Oxford and IBH Publishing Co., New Delhi

5. Chemistry of pesticides, N.N. Melnikov, Springer - Verlag, New York

6. Chemistry of insecticides and Fungicides U.S Sree Ramulu, Oxford and IBH Publishing Co. New Delhi

DYES 5:2:4(35)

Paper I

Chemistry of Intermediates

Introduction to the History of Dyes. Natural to Synthetic dyes. Important landmarks in the Historical development.

Benzene intermediates - Chloronitrobenzenes, Nitroanilines, Bromonitroanilines, Nitroanisoles, Toluene and Xylene Intermediates, Xylidines, Diaminobenzenes, etc.

Napthalene intermediates - H- and, J-acid, R-acid, [illegible] acid, N-W-acid, Chicago acid, Schaffer R and G acid, Naphthols Naphthol sulphonic acids, Napthylamine sulphonic acids.

Anthraquinone intermediates and miscelleneous intermediates

1-Amino and 2-amino anthraquinones, Bromamine acid, Quinazirin, methyl and methylamino anthraquinones, Disperse dye intermediates, Disperse-reactive intermediates, Acid-dye intermediates.

Paper II

Chemistry of Dyes

Introduction, Clawsification of dyes on the basis of of structure and the mode of application to the fibre Colour and chemical constitution of dyes. Chemistry of the following dyes with respect to general structural features, Chemistry, mode of application to fibre, colour shades, synthesis of typical 4-5 dyes, uses.

Azodyes - Acid, acid mordant, direct, milling and stilbene azo dyes.

Basic dyes

Anthraquinone (vat) dyes

Indigoid dyes

Reactive dyes

Disperse dyes

Optical whiteness- Cyanuric chloride based optical

Whiteners 5:2:4(36)

Paper III

Anaalysis and application of Dyes and Dye Intermediates

Analysis of Intermediates - Different methods used in the analysis, Nitrite value determination. coupling value. titanous chloride reduction, chromatography, halogen content determination, set point, iodmetry, metal estimations-Cu, Ni, Cr, etc.

Dyeing - General introduction to dyeing methods. Dyeing methods for the following dyes - Direct, acid, reactive disperse, vat, cationic, sulphur, indigo, azoics.

Quality control and factory layout for dyestuff industry

Effluent treatment and pollution control in dye stuff industry.

Practicals

1. Analysis of intermediates - Nitrite titations, diazocoupling titanous chloride titration, estimations of Cu, Ni , Cr , etc. TLC of intermediates, paper chromatography of dyes.
2. Dyeing- Dyeing of the following dyes on cotton - Direct Azoics, Acid - on wool and silk, TPM - on Silk, Vat, Reactive, Sulphur.
3. Evaluation of the fastness properties of dyes with respect to light, washing and sublimation.
4. Preparation of Methyl orange, Methyl red, Orange II, Fluorescein, Anthraquinone

Books

1. LUBS Chemistry of Synthetic dyes and pigments R. E Krieger Publishing Company
2. Chemistry of dyes and intermediates, Cain, Thorpe and Linstead, 1960
3. Dyeing and Chemical technology of textile fibres, E.R Trotman.
4. Development in the Chemistry and Technology of Organic Dyes J. Griffths, Society of Chemical Industry, Blackwell Scientific Publications.

(5:2:4(37)

5. The Chemistry of Synthetic Dyes, K. Venkataraman Academic Press, Vol. 1-VIII.

6. The Analytical Chemistry of Synthetic Dyes, K. Venkataraman, John Wiley, New York.

7. A Laboratory Course in Dyesing, C.H. Gites, The Society of Dyes and Colourist.

8. The Dyeing of Synthetic Polymers and Acetate Fibres, D. M. Nunn, Dyers Company Publishing Trust.

9. Dyes and Their Intermediates, H.A. Abrahart, Pergaman Press.

10. An Introduction to Synthetic Dyes, D.W. Rangnekar and P.P.Singh, Himalaya Publication, Bombay

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POLYMERS

Paper I

Brief history of macromolecular science. General characteristics of polymers in comparison with common organic compounds. Nomenclature. Distinction between plastics, elastomers and fibres.

Natural polymers - Cellulose, silk, gums, rosin and shellac

Types of polymers - Thermoplastics and thermosettings. Functionality concept
Concept of crosslinking - Linear, branched and crosslinked polymers.

Types of polymerization - Addition, condensation, ionic, coordination. Addition - polymerisation - Mechanism; initiation, propagation and termination processes, initiator, inhibitors. Mechanism of ionic polymerisation.

Methods of polymerization - Bulk, suspension emulsion, solution.

Necessity of copolymers and copolymerization, Blocks and graft copolymers.

Detailed study of the following thermosetting polymers with respect to synthesis, chemistry, properties and applications.

i. Phenol - formaldehyde resins

ii. Amino-resins - Urea - formaldehyde and melamine formaldehyde resins

iii. Polyurethanes -

iv. Epoxy resins - Grades of epoxy resins, curing process and its importance with mechanism

Polycarbonates, silicones

Elastomrs - polyisoprene, polybutadiene, Neoprene

Paper II

Detail study of the following thermoplastic polymers with respect to synthesis, chemistry, properties and applications

Polyolefins - Polyethylenes - HDP, LDP, LLDP, Polypropylene, Ethylene-propylene copolymers.

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Polyvinyl chloride - Grades of PVC, Teflon

Polystyrene - Homopolymers, copolymers such as SBR, ABS, SAN.

Vinyl polymers - Polyvinyl acetate and its modifications like PVA, PVB and polyacetals.

Polyamines - Nylon-6, Nylon-66 and other Nylons

Polyethers and polyesters - Terephthalates.

Cellulosics such as escers,, ethers, acetates, butyrate, mitrate, CMC : Regenerated culluloses.

Paper TTT

Molecular weight and molecular weight distribution - Number, weight and viscocity average molecular weights of polymers. Methods of determining molecular weight; Practical significance of molecular weight distribution. Size of polymers.

Introductory concepts of kinetics of polymerization and carother's relation.

Glassy stage, glass transition temperature, TGA, Factors affecting GTT, Crystallinity in polymers.

Viscocity, solubility, optical properties, electrical properties, thermal properties, mechanical properties of polymers.

Degradation of polymers by thermal, oxidative, mechanical and chemical methods.

Polymer processing - Compression moulding, casting, extrusion, fibre spinning, injection moulding, thermoforming, vulcanization of elastomers, Polymer industry in India.

Practicals

1. Determination of - (i) Acid value - Rosin ester gum, plasticisers, polyester resin, alkyd resin (ii) Iodine number - linseed oil, castor oil (iii) Saponification value - Coconut oil, polyester (iv) Melting point and softening point - Epoxy resin, ester gum, nylon-6 (v) Viscosity - Nitrocellulose - Polystryene, PV acetate (vi) Hydroxyl value -

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2. Preparation of representative polymers : Bulk polymerization - polystyrene, polyvinyl acetate, polyacrylamide, polyacrylic acid.
Solution polymerization :: phenol- formaldehyde, Urea-formaldehyde, alkyd resin.

3. preparation and analysis of the above (viscocity, m.p, mol.wt. determination)

3. Identification of simple polymers by simple physical and chemical tests.

4. Analysis of raw materials - Phenols, formaldehyde, urea, melamine, epichlorohydrin

Books

1. Billmeyer, Textbook of polymer Science, John Wiley and Sons

2. D.D. Deshpande, physical Chemistry of macromolecules, Vishal Publications, New Delhi, 1985.

3. Polymer Science, V.R. Gowarikar, N.V. Vishwanathan and J. Sreedhan, Wiley Eastern Ltd., 1986.

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Appendix - B

SUMMARY CHART

BIOTECHNOLOGY

Sl.No.	Semester	Name of the paper	Total period per week	Exam.hours
1.	I	Biochemistry	3	3
2.	I	Maths. & Computers(with computer lab.)	3	3
3.	I	Biochemical Techniques	6	6
4.	II	Cell Biology	2	3
5.	II	Genetics	2	3
6.	II	Microbiology	2	3
7.	II	Microbiological techniques	6	6
8.	On the job training I Summer: One month followed by Report			
9.	II	Biophysics	2	3
10.	III	Molecular Biology	3	3
11.	III	Methods in Molecular & Cellular Cellular Biology	6	6
12.	IV	Immunology	2	3
13.	IV	Animal Cell Cultures	2	3
4.	IV	Recombinant DNA Technology	2	3
5.	IV	Immunological Methods	6	6
6.	On the job training II Summer: One month followed by Report			
7.	V	Animal Cell Biotechnology	2	3
8.	V	Plant Biotechnology	2	3
9.	V	Environmental Biochemistry	2	3
0.	V	Cultural Methods	6	6
.	VI	Project work	One Semester under supervision of chose faculty.	
.	VI	ENTERPRENEURSHIP, THEORY AND PRACTICE IN A PROJECT		

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PROPOSED COURSE CONTENTS
UGC Vocational Programme in Biotechnology

PAPER I
BIOCHEMISTRY

Nature of biological material 01

General properties of organic and inorganic compounds 03

Suitability of organic compounds for generation of structure, storage of energy and information 02

Hydrophilic and hydrophobic groups in biological molecules 01

Classification of biomolecules based on their role in bioprocesses. 05

i. Molecules involved in generation of mechanical stability pepetidoglycans, polysaccharides and membrane lipids.

ii. Molecules involved in information storage and retrieval - the nucleic acids.

iii. Molecules executing mediator and catalytic functions - the proteins.

iv. The signal molecules

Perspectives of biological macromolecules : the repeating units in nucleic acids and proteins 04

Helicity, bending, looping, pleats, salt bridges etc and their determinants. The basis for intermolecular interaction e.g.; enzyme-substrate and antigen-antibody recognition.

Nature of biochemical reactions underlying biosynthesis and degradation. Tole of enzymes in such reactions. Protein and non-protein enzymes. Kinetics of enzyme catalysed reactions 05

In vitro activity of purified enzymes and their applications in industry. Various uses of enzymes enzymes in food processing, medicine, diagnostics and production of new compounds. 05

Enzymes as research tools - ELISA methods, modification of biological compounds with the help of enzymes 03

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PAPER II
MATHS AND COMPUTERS

The set theory properties of subsets	02
Linear and geometric functions	01
Limits of functions, derivatives of functions	02
The binomial theorem	01
Logarithm	02
Differentiation	05
Integration	05
Probability calculations	02
Methods of sampling, confidence level	01
Measurement of central tendencies	02
Measurements of deviations	02
Computer : General introduction to computers, organization of computers, digital and analogue computers, computer algorithm	01
Computers in on line monitoring and automation	01
Application of computers in co-ordination of solute concentration, PH and temperature etc of a fermenter in operation.	02
Demonstration of the above utilities (alongwith the above lectures)	

PAPER III
BIOCHEMICAL TECHNIQUES

Quantitative estimation of the following in biological samples

Sugar in given solutions	1x3 hrs
Sugar in biological samples	1x3 hrs
Extraction and separation of lipids	2x3 hrs
Estimation of proteins	2x3 hfs
Estimation of DNA/RNA	2x3 hrs.

5:2:4(44)

Isolation and purification of proteins	10x3 hrs
Assay of enzyme activity	2x3 hrs
Kinetic studies on enzymes	5x3 hrs
Chromatographic methods for separation of macromolecules	5x3 hrs

PAPER IV
CELL BIOLOGY

Cell as a basic unit of living systems. The cell theory 01

Precellular evolution : artificial creation of "cells" 01

Broad classification of cell types: PPLOs, bacterial, 02
eukaryotic microbes, plant and animal cells. A detailed classification of cell types within an organism. Cell, tissue, organ and organism as different levels of organization of otherwise genetically similar cells.

Ecological amplitude of cells in high altitude, 02
sediments, arctic, hotspring, arid, brackish and freshwater environments.

Biochemical composition of cells (proteins, lipids, 01
carbohydrates, nucleic acids and the metabolic pool).

Ultrastructure of the cell membrane 02

Structure and function of cell organelles;
ultrastructure of cell membrane, cytosol, golgi bodies, endoplasmic reticulum (rough and smooth), ribosomes; cytoskeletal structures (actin, microtubules etc.) Mitochondria, chloroplasts, lysosomes, peroxysomes. nucleus (nuclear membrane, nucleoplasm, nucleolus chromatin).

Cell division and cell cycle (incl. cell synchrony and 03
its applications)

Cell-cell interaction 01

Cell locomotion (amoeboid, flagellar and ciliar). 02
muscle and nerve cells.

Cell senescence and death 01

Cell differentiation in plants and animals 02

5:24(45)

PAPER V
GENETICS

Nature of genetic material; nucleic acids; DNA replication. 03

Mendelian laws of inheritance, gene interactions 02

Sex determination in plants and animals; sex linkage; non-disjunction as a proof of chromosomal theory of inheritance 03

Linkage; mapping genes; interference; coincidence in pro and eukaryotes 03

Chromosomes: chemical composition; structural organisation of chromatids, centromeres, telomeres, chromatin, nucleosome organisation; eu- and heterochromatin; special chromosomes (e.g, polytene and lampbrush chromosomes); banding patterns in human chromosomes 04

Structural and numerical aberrations involving chromosomes; evolution of wheat, cotton and rice; hereditary defects- Kleinefelter, Turner, Cri-du-chat and Down syndromes 04

Mutations - spontaneous and induced; chemical and physical mutagens; induced mutagens; induced mutations and microbes for economic benefit of man 03

Basic microbial genetics, conjugation, transduction, transformation; isolation of auxotrophs, replica plating techniques, analysis of mutations in biochemical pathways, one gene-one enzyme hypothesis 04

Extrachromosomal inheritance, mitochondrial and chloroplast genetic systems. 02

Population genetics: Hardy-Weinberg equilibrium, gene and genotypic frequencies 02

Recommended Books:

Strickberger M.W., Genetics

Goodenough U. (1990) Genetics

Lewin B. (1990) Genes IV

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PAPER VI

MICROBIOLOGY

Development of microscopy (optical, TEM AND SEM)	01
Pasteur's experiments disproving spontaneous generation	01
The concept of sterilization. Methods of sterilization (Dry heat, wet heat, radiation, chemical and filteration etc)	02
Concept of microbial species and strains	01
The various forms of microorganisms - PPLOs,cocci, bacilli and spirilla	01
Genetic homogeneity in clonal populations	01
Spontaneous and induced variation arising in microbial population	04
Gene transfer in microorganisms	03
Nature of the microbial cell surface.Gram positive and gram negative bacteria. Kinds of flagella serotypes	02
Prokaryotic and eukaryotic microbial cells	02
Nutritional classification of microorganisms	01
Microbes in extreme environments - the thermophiles and alkalophiles	01
Pathogenic microorganisms. Defence mechanism against microorganisms	02
Symbiosis and antibiosis among microbial populations	02
N - fixing microbes in agriculture	02
Microbial metabolism. Fermentation products. A survey of products from microorganisms. Strain improvement by enrichment, selection and recombinant DNA methods. Production of heterologous proteins of interst in microorganisms.	04

2

5:2:4(47)

PAPER VII

MICROBIOLOGICAL TECHNIQUES

Aseptic techniques :	2x3 hrs
Cleaning of glassware	
Preparation of media, cotton plugging and sterilization	2x3 hrs
Personal hygiene-Microbes from hands, tooth-scum and other body parts	2x3 hrs
Isolation of microorganism from air, water and soil samples. Dilution and pour plating. Colony purification	2x3 hrs
Enumeration of microorganisms. Total vs viable counts.	2x3 hrs
Indentification of isolated bacteria. Gram staining, other staining methods, metabolic characterization (e.g. IMVIC test)	2x3 hrs
Growth curve of microorganism	3x3 hrs
Antibiotic sensitivity of microbes, use of antibiotic discs	3x3 hrs
Testing of water quality	4x3 hrs
Test for antibodies against given bacteria	3x3 hrs
One step growth of bacteriophage	3x3 hrs
Culture from body fluids (Stool, Urine, Blood	2x3 hrs
Alcoholic and mixed-acid fermentation	2x3 hrs

PAPER VIII

ON THE JOB TRAINING

The students should be assigned to assist a clinic (in a hospital), a fermentation plant, brewery of bakery and watch the various stages in brewing and baking and post fermentation processing

prior arrangement must be made of the mode of interaction of the educational institution with the clinic and the industry.

5:2:4(48)

PAPER IX

BIOPHYSICS

Energetics of a living body. Sources of heat limits to temperature. Heat dissipation and conservation	02
Lambert-Beer law. Spectrophotometry and colorimetry Primary events in photosynthesis	02
Strategies of light reception in microbes, plants and animals.	01
Correction of vision faults	01
Electrical properties of biological compartments	01
Electricity as a potential signal	
Generation and reception of sonic vibrations. Hearing aides	02
Intra- and intermolecular interactions in biological systems. Spatial and charge compatibility as determinant of such interactions	02
Physical methods applied to find out molecular structure :	05
X-ray crystallography and NMR	
General spectroscopy - UV-vis, fluorescence, atomic absorption, IR, Raman spectra	05
Physical methods of imaging intact biological structures :	10

- Ultrasound
- Optical filters
- X-ray
- C.T scan
- ECG
- EEG
- NMR imaging

PAPER X

MOLECULAR BIOLOGY

Molecular basis of life	02
Structure of DNA	01
DNA replication both prokaryotes and eukaryotes	04

5:2:4(49)

DNA recombination molecular mechanisms prokaryotic and eukaryotic	02
Insertion elements and transposons	03
Structure of prokaryotic genes	01
Prokaryotic transcription	03
Prokaryotic translation	03
Prokaryotic gene expression (lac, his,trp, catabolic repression)	10
Structure of eukaryotic genes	02
Eukaryotic transcription	02
Eukaryotic translation	02
Eukaryotic gene expression transcription factors etc	10
Gene expression in yeast	02
Gene expression in protozoan parasites	02
Gene organization and expression in mitochondria chloroplasts	06
Post translation regulation of gene expression	02
Development and environmental regulation of gene expression	03

PAPER XI

METHODS IN MOLECULAR AND CELLULAR BIOLOGY

Cytological preparations :	
- Fixation, dehydration and staining	3x3 hrs
- Squash in stain	2x3 hrs
- Embedding and sectioning	3x3 hrs
Cell counting methods :	
- The haemacytometer and other aides	2x3 hrs
Measurements with the help of light microscope	
- Calibration of occular micrometer	1x3 hrs
- Finding out average cell size	1x3 hrs
- Chromosome lengths	1x3 hrs

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Separation of cell types (from blood) 1x3 hrs

Separation of cell organelles :

- Methods for cell lysis : rupture Osmotic/ Chemical/Enzymatic lysis of cells followed by centrifugation. Monitoring cell lysis by release of cellular material and by change in light scattering etc 2x3 hrs

- Mechanical rupture of cells : Ultrasonic vibrations; French pressure cell followed by centrifugation for cell organelles 2x3 hrs

Extraction of cellular materials

- Extraction in saline buffers 2x3 hrs
- Extraction in solvents 2x3 hrs
- Precipitation from extracts 2x3 hrs

Separation of the constituent molecules of the extract in aqueous buffer

- Gel filtration 3x3 hrs
- Ion exchange chromatography 2x3 hrs

Thin layer chromatography of extracted material 2x3 hrs

Isolation of chromosomal and plasmid DNA from bacteria 4x3 hrs

Restriction digestion of DNA and assigning restriction sites (may be done as a demonstration) 2x3 hrs

Making competent E.Coli 2x3 hrs

Transfection of plasmid DNA and selection for transformants. 3x3 hrs

PAPER XII
IMMUNOLOGY

The immune system and Immunity along with historical perspective 02

Antigen-antibody and their structure 03

The organs and the cells of the immune system and their function 06

Antigen-antibody interaction 03

Humoral and cell mediated immunity (role of MHC and genetic restriction) 06

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Origin of diversity in the immune system	02
Effector mechanisms	04
Immunity of infectious diseases, vaccines	04

PAPER XIII
ANIMAL CELL CULTURE

History of development of cell cultures	01
The natural surroundings of animal cells	01
Metabolic capabilities of animal cells	02
Simulating natural condition for growing animal cells	01
Importance of growth factors of the serum	01
Primary cultures. Anchorage dependance of growth non anchorage dependent cells	01
Secondary cultures. Transformed animal cells Established/continous cell lines	02
Commonly used animal cell lines - their origin and characteristics	02
Growth kinetics of cells in culture	01
Applications of animal cell culture for studies on gene expression	01
Organ culture	02
Transfection of animal cells : Selectable markers, HAT selection, antibiotic resistance etc	02
Cell fusion	02
Transplantation of cultured cells	01
Differentiation of cells	02

PAPER XIV

RECOMBINENT DNA TECHNOLOGY

What is gene cloning and why do we reed to clone a gene?	02
Tools and techniques plasmids and other vehicles genomic DNA, handling of DNA RNA CDNA, RT enzymes and other reagents techniques, laboratory requirement.	03

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Safety measures and regulations for recombinant DNA work	
Choice and selection of the tools and the techniques	02
Vehicles : Plasmids and bacteriophages, available phagemids, cosmids, viruses	04
Purification of DNA from bacterial, plant and animal cells	02
Manipulation of purified DNA	03
Introduction of DNA into living cells	02
Cloning vectors for E.coli	02
Cloning vectors for organisms other than E.coli yeast, fungi, plants-agrobact, plantivirus animal viruses	02
Application of cloning in gene analysis	03
- How to obtain a clone of a specific gene - Studying gene location and structure - Studying gene expression	
Gene cloning and expression of foreign genes in research and biotechnology	03
- Production of protein from cloned genes	
Gene cloning in medicine	04
- Pharmaceutical compounds - artificial insulin gene - recombinant vaccine - diagnostic reagents.	

PAPER XV

IMMUNOLOGICAL METHODS

Purification of antigens	4x3 hrs
Raising polyclonal antibodies	Spread over 8 weeks
Purification of antibodies	4x3 hrs
Conjugation and labeling of antibodies	2x3 hrs
Enzyme-linked immunoassay	3x3 hrs
Radioimmunoassay	3x3 hrs
Radial immunodiffusion analysis	2x3 hrs

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Generation of ascitic fluid	3x3 hr
Diagnosis of an infectious disease by an immunoassay	3x3 hr

PAPER XVI

ON THE JOB TRAINING

This should be taken up during summer over a period of one month preferably in an immunology/veterinary/virology institute or a laboratory using recombinant DNA methods.

PAPER XVII

ANIMAL CELL BIOTECHNOLOGY

General metabolism	02
Special secondary metabolites/products (Insulin, Growth hormone, Interferon, tplasminogen activator, factor VIII etc.)	03
Expressing cloned proteins in animal cells. over production and processing of chosen protein	02
The need to express in animal cells	01
Production of vaccines in animal cells	01
Production of monoclonal antibodies	02
Growth factors promoting proliferation of animal cells (EGE,FGF,PDGF,IL-1, IL-2, NGF, erythropoietin etc)	04
Bioreactors for large scale culture of cells	04
Transplanting cultured cells	01

PAPER XVIII

PLANT BIOTECHNOLOGY

Introduction to the vitro methods. Terms and definitions. Use of growth regulators	02
Beginning of in vitro cultures in our country (ovary and ovule culture, in vitro pollination and fertilization	01
Embryo culture, embryo rescue after wide hybridization, and its applications.	01

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Introduction to the processes of embryogenesis and organogenesis and their practical applications	02
Clonal multiplication of elite species (Micropropagation) exillary bud, shoot-tip and meristem culture	02
Haploids and their applications. Somaclonal variations and applications (Treasure your exceptions)	02
Endosperm culture and production of triploids	01
Practical applications of tissue and organ culture (summarizing the practical applications of all the above mentioned techniques)	01
Single-cell suspension cultures and their applications in selection of variants/mutants with or without mutagen treatment (of haploid cultures preferably)	02
Introduction to protoplast isolation: principles and applications	02
Testing of viability of isolated protoplasts	01
Various steps in the regeneration of protoplasts	01
Somatic hybridization - an introduction	02
Various methods for fusing protoplasts. Chemical, electrical	01
Use of markers for selection of hybrid cells	01
Practical applications of somatic hybridization (hybrids vs cybrids)	01
Use of plant cell, protoplasts and tissue culture for genetic manipulation of plants. Introduction to A. tumefaciens	02
Tumor formation on plants using A. tumefaciens (Monocots vs Dicots)	01
Root-formation using A. rhizogenes	01
Practical application of genetic transformation	01

5:24(55)

PAPER XIX
ENVIRONMENTAL BIOTECHNOLOGY

Renewable and non-renewable resources 02

What is renewable should be bioassimilable/ biodegradable 02

Major consumer items: items: Food, fuel and fibres 01

Conventional fuels and their environmental impacts: 02

- Firewood
- Plant and animal wastes
- Coal
- Gas
- Animal oils

Modern fuels and their environmental impacts: 05

- Methogenic bacteria and biogas
- Microbial hydrogen production
- Conversion of sugars to ethanol. The gasohol experiment
- Solar energy converters - Hopes from the Photosynthetic pigments
- Plant based perroleum industry ?
- Cellulose degradation for combustible fuel

Biotechnological inputs in producing good quality natural fibres 03

- Transgenic sheep and transgenic plants

Microbiological quality of food and water 02

Thratment of nunicipal waste and industrial effluents 03

Degradation of pesticides and other toxic chemicals by microorganisms. 02

Thuringiensis toxin as a natural pesticide 01

Biological control of other insects swarming the agricultural fields 02

Enrichment of ores by microorganisms 02

Biofertilizers. Nitrogen fixing microorganisms enrich the soil with assimilable nitrogen 03

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PAPER XX
CULTURE METHODS

Initiating plant tissue culture: (dedifferentiation of explants) 6x3 hrs

Growth of plant cells into undifferentiated mass 6x3 hrs

Large scale cultivation of plant cells in suspension 4x3 hrs

Induction of differentiation by modulating the hormonal balance 6x3 hrs

Culture of lymplocytes from blood samples 4x3 hrs

Preparation of media, Filter sterilization, monitoring microbial contamination (bacteria, fungi and mycoplasma)
Cloning of animal cells by cell and colony purification

Fusion of cultured cells with myeloma cells 8x3 hrs

Production of monoclonal antibodies at a large scale 6x3 hrs

Demonstration/operation of large scale fermenters 6x3 hrs

PAPER XXI

PROJECT WORK

The students will be assigned to generate data on certained research projects and/or compile available information from literature on a given topic of biotechnological relevants. The project work will span over a period one semester under the supervision of chosen faculty member.

PAPER XXII

ENTERPRENEOURSHIP

The students will be delivered lectures on how to select for a product line, design and develop processes, economies on material and energy requirements, stock the product and release the same for marketing etc. The basic regulations of excise also should be aprise to the candidates. In parallel the students will be asked to survey the demand for a given product, feasibility of its production under the given constraints of raw material energy input financial situations export potential etc. Procedural details on how to select process, how to move for loans, how to operate and how to repay the loans in a phasic manner should also be highlighted during the lectures. The semester should end with submission of a draft project by the students.

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REQUIREMENTS FOR IMPLEMENTATION OF THE PROPOSED COURSE IN BIOTECHNOLOGY AS A VOCATIONAL STREAM AT UNDERGRADUATE LEVEL.

EQUIPMENT AND LABORATORY:

A laboratory space to accommodate at least 15 students at a time providing ca 2 square meter bench space will be required in addition to the space for housing/installing the major equipment will be required.

The following items of equipment will be essential:

1. An autoclave or a large capacity preessure cooker (20 litres) for routine sterilizaiton of media and laboratorywares The existing labs may already have this.
2. An oven (ca 70 cm x 70 cm x 50 cm) useable in the range of 180 c to 200 c for drying and sterilization of glasswares. The existing laboratories may already have this.
3. An incubator for use in the range of 25 c to 70 c (dimensions as for oven under '2' above
4. An illuminated temperature controlled (20 c to 30 c) area for plant tissue culture (A BOD incubator may be adapted for the purpose).
5. A CO_2 incubator for animal cell culture.
6. Microscopes preferably with oil immersion objective and phase optics. The existing laboratory may lready be having this.
7. A computer terminal with requisite software for demonstration and use under paper II.
8. A spectrophotometer/colorimeter with UV and visible light sources.
9. A water bath/incubator thermostatted to work over the range 20-100 C
10. Vortex mixers (one per work bench)
11. Electrophoresis system for horizontal and vertical run (e.g.,the units marketed by Biotech)
12. Microfuge (e.g. the units marketed by Remi).
13. Glassplates for casting TLC and/or electrophoresis.

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14. A provision for sufficient silica gel, acrylamide and associated chemicals.

CEACHING REQUIREMENTS:

Paper Nos. 1,4,5,6 and practicals based on them can bee taught by the faculty currently teaching various bio-science disciplines. However, an exclusive faculty must be recruited for effective teaching of Molecular Biology and Recombinant DNA Technology. Other papers may require inter-departmental cooperation e.g., Biophysics, Maths and Computers etc.

Enterprenuership - related courses may be taught by managerial staff of chosen companies.

The on the job training is an important component of the course and students must be sent to field/market/laboratories/ institutions as suggested.

The exclusive teachers should have M.Sc. in Bioscience/ Biotechnology preferably with a Ph.D. degree and proven experience of work in Molecular Biology/Genetic Engineering/Biotechnology.

TEACHERS TRAINING

A recurring update in the subjects taught under the paper numbers 10 (Molecular Biology), 14 (Recombinant DNA Technology) will be essential for the faculty taking up to participate in the proposed course. This could be organised at institutions committed to pursue research in these areas (e.g.,Jawaharlal Nehru University, Indian Institute of Science, Tata Institute of Fundamental Research, Bhabha Atomic Research Centre, Center for Cellular and Molecular Biology, Bose Institute etc.). Updates/refreshers in papers covering mainly application of modern biology can likewise be organised with the help of groups specialized in the respective areas. (e.g. paper 13 and 15 can be assigned to the National Institute of Immunology, Paper 17 and 18 to JNU and/or DU.

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APPENDIX - C

OUTLINE OF COURSES

1. Subject Title : Mass Communication - Video Production.

2. Subject Objectives : To train students for the professional Video Productions.

3. Job Potential:

i) Self - As freelance production assistants to earn about Rs.5000/ p.m.

ii) Wage - As production assistants with established producers with a salary of Rs4,000/-p.m.

Pre - requisite of admission.

High School, 10 + 2 any other

4. Permissible combination of subjects including any two of History/Political, Social Work/Sociology.

5. i) Contents

Papers	Syllabus	
I ,II,III,IV,V		- Theory
VI,VII,VIII,IX		- Practicals
		- Reference/Reading
		- Material
		Equipment.

ii) On-the-job Training - 1 - After fourth Semester

Paper - 5 (a)

iii) On-the-job training - 2 - After Eighth Semester

Paper 5 (b)

iv) Paper - 9 - Enterpreneurship Development

Contd.../-

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VIDEO PRODUCTION

This stream may cover all the fundamental aspects of video production for the media and it may assist the students in working with Hi-8 equipment, so that after doing this stream, they may easily get absorbed in the electronic media production market as Production Assistants and the brightest among them even as Producers. Apart from the three courses in Mass Communication there may be 6 courses in Video Production stream.

They may be :-

	Total	Theory	Pract.
Paper 1 Introduction to Mass Communication	90 period	45 period	45 period
Paper 2 Sound for the Media	90 period	45 period	45 period
Paper 3 Media scene in India	90 period	30 period	60 period
Paper 5 Media Scriptwriting	90 period	30 period	60 period
Paper 6 Vidoe for Communication	180 period	45 period	135 period
Paper 7 Video-Studio Production	180 period	45 period	135 period
Paper 8 Video-Studio Production	180 period	45 period	135 period
Paper 9 Enterpreneurship	90 period	45 period	45 period

It is suggested that teaching may be spread out as shown in the table given below, taking into account that there will be 12 periods of teaching for 180 days per year for three years.

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Ist Year		IInd Year		IIIrd Year	
Ist Semester	2nd Semester	Ist Semester	2nd Sem.	Ist Sem.	2nd Sem.
2 Course 180 Periods	2 Courses 180 Periods	1 Course 180 Periods	2 Course 180 Periods	1 Course 180 Periods	1 Course 180 Periods
1 Core + 1 Video sound for media	1 Core + 1 Video media script writing	1 Video + Video for Communi-cation	1 Video + Video Studio Production	1 Core + 1 Video Media Appreci-ation	1 Video + Video Electr-onic Film Prod.

As shown, the three core Paper 1, Paper 3, Paper 9 and the Paper 2, Paper 4, Paper 5, in video production will need 90 period of teaching (both theory and practicals). But the last three courses in Video production stream, will need 180 periods of teaching. The teaching programme should include visits to professional centres of video productions within the City. Educational tours during summer vacation may also be arranged to other Cities, if the facility is not available within the City.

The teaching load may be handled by two Readers, one Lecturer and a demonstrator for a batch of 20 students. One Reader may function as person in arranging guest lecturers and visits to Studies.

Most of the professionals working in the field have learnt the trade while on the job, by trial and error method and there is hardly any methodical teaching of the video production at the graduate level. There are some private institutions in India giving some sort of training. They are substandard and expensive. So there will be many aspirants to take up this course being in the University system and also the job potential being very good.

The proposed syllabus for the six courses in the Video production stream along with the lecture hours and hours needed for practicals are attached alongwith.

Contd..../-

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SUMMARY CHART

MASS COMMUNICATION-VIDEO PRODUCTION

Sr. NO.	Year	Semester/ Terms	Name of the paper	L (period/ week)	P	T	Total teaching load per week	Exami- Theory. (hours)	Hours Prac. (hours)
1.	1	1	Introduction to Mass Communication	3	3		6	3	4
2.	1	1	Sound for Media	3	3		6	3	4+ Viva
3.	1	2	Media Scene in India	3	3		6	3	4
4.	1	2	Media Script	3	3		6	3	4
5.	On the job training I			Summer			One Month		
6.	2	1	Video for Communication	3	9		12	3	4
7.	2	2	Video Studio	3	9		12	3	4
8.	On the job training II			Summer			One Month		
9.	3	1	Enterprenuership Marketing	3	3		6	3	-
10.	3	1	Media Appreciation	1	5		6	3	3
11.	3	2	Video Electronic Film Production	3	9		12	3	4+ Viva

Contd..../-

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Paper - I

Introduction to Mass Communication

a) Concepts and theories - 15 Periods

Communication concepts, process and function, Inter-personal, group and mass communication Relevance of communication theories to practice, Model of communication.

Impact and effect of Communication

b) Communication teachniques - 15 Periods

Feed back and evaluation of communicatkon effect

Interview and questioners

Methods of data analysis

Library Search

c) Language and communication - 15 periods

Concepts and pracice

Language and Mass Communication

Language uses in different mass media

Language and Society

Practices - 3 Period per week for 15 weeks

Converting all the above three areas of this peper:

News reporting and editing

Newspaper layout, News analysis

Desk top publishing teachniques and word processor

Sample techniques, interviews and questionaries forms

Language for Mass Communication _ exercise in sports, advertisi ng, social and political spheres.

Books : -

1. Prospectives on Human Communicatbon by Aubrey B.Fisher (Macmillan)
2. Science of Human Communication ed. by Wilber Schramm

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3. Process and effect of Mass Communication ed. Wilber Schramm
4. Communication in India by J.S. Yadava (Muneo)
5. Communication Research some reflections by J.S. Yadava (Muneo)
6. Introduction to communication studies by J.Fiske Methac London
7. The psychology of reading, by Alan Kennedy, Methuern (London).

Paper II

Sound for the Media

This course may cover all the fundamental aspects in Sound Recording for the electronic media and it may assist the students in working with the sound recording equipments and learning the sound recording techniques in Video Production.

Lecturers, discussions, demonstrations, in class exercises and analysis of sound tracks for the media will cover almost all the classic basic aspects of the effective use of sound recording equipments and creative use of sound for the media.

	Theory 3 periods in Periods per week for 15 weeks
1. Characteristics of sound wave and its propogation	4
2. Accounstics, Echo, R.T.Decibets etc.	2
3. Quality of sound, Frequency reference S/N ratio distortions	2
4. Mechanism of Human speech and hearing physiology and psychology, thresholds of hearing and feeling etc.	2
5. Microphones - different types	2
6. Mikes-special types and accessories, wireless, lapet, riflector type, shotgun.	4
7. Directional response and polar diagram	2
8. Factors governing the selection of mikes	1

Contd..../-

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9. Types of cables and connec tors and their uses	1
10. Magnetic recording principles	1
11. Tape recorders and playback machines	2
12. Audio tapes	2
13. Sound safety, Erasine, dole sheet, storage	2
14. Post production-editing, subbing laying trackes	1
15. Mixing of Sound	3
16. Frequency response controls	2
17. Audio sweening	1
18. Monitoring	1
19. Organisation of sound effects and music library	2
20. Difference in the recording, editing and mixing for different media	2
21. Audio visual contrast and harmony creative application	4
22. Sound recordists role in a Production crew	2

Paper - III

Media Scene in India

a. Evaluation of Press and its role in different Socio-economic and political systems	15
b. Press laws in India : Constitution and press laws	5
c. Introduction to Radio as a medium of mass communication and its characteric- radio development in India, Techniques of radio programme production in India.	10
d. Introduction of TV as a medium of mass communication and its characteristics TV programme and techniques of production.	10

Contd.../-

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e. Government information and publicity system 15
Basic principles of Govt. publicity
Govt. publicity guidelines operation of
Govt. publicity.

Practice : 3 period per week
covering press, radio TV and Govt.
information and publicity systems
in India - case studies.

Books recommended:

1. Report of 2nd press commission of India (Govt. of India)
2. The Press Chalapathi Rao
3. The Asian Newspaper Reluctant Revolution by John lent (Lowa State Press)
4. Radio - A Guide book to broadcasting technique by E. Evans
5. Hand book of broadcasting by Waldo Abbot & R. Rider (McGraw Hill)
6. Techniques to Television Production by Rudy Bretz (McGragg Hill)
7. Broadcasting and the people by Mehra Massani (NBT)
8. Information and Broadcasting Ministry's Annual Reports
9. Mass Media in India (Research and Reference division)

Paper IV

Media Scriptwriting - Video

		Theory lecture	Pract/ Tutorials
1.	Introduction, Role of writer, ellaborative efforts	2	
2.	Production Proces, requirements, stages	2	
3.	Elements of structure-Beganing, middle, end	2	
4.	Indentifying significant detail-concepts	2	
5.	Defining parameters of production audience budgets	2	

Contd.../-

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6.	Subject research	2	3 periods per week
7.	Writing an audio visual script	2	3 periods per week
8.	Writing a shooting script	2	3 periods per week
9.	Scripting the unscriptable	2	3 periods per week
10.	Introduction to research teaching	2	3 periods per week
11.	Sources of information and materials	2	3 periods per 2 weeks
12.	Organising and presenting material	2	3 periods per week
13.	Points of view, credibility, accuracy	2	3 periods per week
14.	Introvening as a resource in writing	2	3 periods per week
15.	Transition devices available to the writer	2	3 periods per week
16.	Use of sound	2	
17.	Visual grammer	2	
18.	Narrative styles	2	3 periods per week
19.	Writer and the law	2	3 periods per week
20.	Writer and the budger	2	3 periods per week
21.	Writing narration	2	3 periods per 2 weeks
22.	Writing for current affairs	3	3 periods per 2 weeks

Paper V

MEDIA APPRECIATION

1. General introduction - why appreciate, criteria - subjective/objective, Film, TV, Art, advertising, graphics etc.
2. How to nead a film - approaches.
3. Methods, Anti-methods, misunderstandings
4. Film theory .
5. Advertising - reduction and international messages - analysis

Contd.../-

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6. Fiction - documentary, relation, scripting, deconstruction/ reception.

7. Popular/populism TV culture- high theory - low culture, detective story/popular videos.

8. Competitive and narrative studies across media - the mediamess

9. Problematies of writing on or about media - The media-mess

10. Personal/Social issues/reception theories.

This course can be covered in 30 lectures, 45 mts. each per topic. But to drive home the point many programmesare to be viewed. These viewing sessions may be called as Lecture demonstrations and 60 hours are required to cover the syllabus.

Paper VI

Video for Communication

	(Theory)	(Pract.) 9 period per week for 15 weeks
1. Video Camera Basic design	10	3 weeks
2. Video tape recorder Video track	5	2 weeks
3. Basic shots Terminology	10	4 weeks
4. Lighting and Exposure Lighting equipment	10	3 weeks
5. Electronic editing off line and on line edit	10	3 weeks
	45	134

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Paper - VII

Video Studio Production

		Theory Lecture (Hours.)	Pract. (Hours)
			4 pd.per week for 15 weeks
1.	Sound for the Video Studio and location sound	10	5 weeks
2.	Staffing responsibilities Camera, Audio	10	5 weeks
3.	Studio production and production control Multiple camera set up	25	5 weeks
		45	135

Paper VII

Video Electronic Film Production

		Theory Lecture (Hours.)	Pract. (Hours.)
			9 periods per Week
1.	Proposal	2	½ week
2.	Budgeting	2	½ week
3.	Location survey	2	1 week
4.	Shooting Script	2	½ week
5.	Production meeting	2	½ week
6.	Shooting	2	2 weeks
7.	Editing (Assemble)	2	1 week
8.	Special effects	2	1 week
9.	Collection/recording sound effects/ and music	2	2 weeks
10.	Recording Narration	2	½ week

Contd.../-

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11.	Laying commentary track	2	2 weeks
12.	Laying music and effects track	3	2 weeks
13.	Mixing	3	2 weeks
14.	Marketing	2	½ week
		30	15

Note :

Students will decide their topic in consultation with faculty members of their dept to prepare 'project' an issue, proble etc and will submit a report.

Reading List _ Books for reference

1. Video Production hand book - By Millison (Focal Press)
2. Working with Video Production - A comprehensive guide to the world of video By Winston Brian and Julia Keydal
3. Basic TV staging - By Millerson Gerald (Focal Press)
4. Video Camera techniques - By Millerson Gerald (Focal Press)
5. TV sound operations - By Glyn Alkin
6. Sound Techniques for Video + TV Media Manual Series (Focal Press)
7. The moving image - Production Principles as practices Foresman Company
8. Understanding Television - By Praeger
9. Production asst in TV and Video - By Focal Press

Contd..../-

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VIDEO PRODUCTION LAB FOR MEDIA APPRECIATION, VIDEO FOR COMMUNICATION & PRODUCTION, VIDEO ELECTRONIC PRODUCTION AND PROJECT

1. Studio

Multipurpose small studio of size 15' x 24 ' x 12'H. Accoustically treated, provided with low noise airconditioning with provision of hanging lights from ceiling and sound proff dooe. This is to be used for

(a) Vioce recording

(b) Single person Camera shot for commentry or naration.

(c) Video and sound recording of discussion with one or two persons.

Light required

1. Fill light	1 No.
2. 500/800 watts back light	2 Nos.
3. 1 KW spots	2 Nos.
4. Stands	4 Nos.

2. ENG Equipment

for outdoor as well as studio recording
1 CCD Camcorders V H18 EVO 9100 3 Nos.
with supplied accessories :

Shoulder belt	1 No.
Shoulder brace	1 No.
Grip	1 No.
Lens Cap	1 No.
Lithium battery	1 No.
Connecting cable	
Tripod	1 No.

AC adaptor/battery charger AC-V30 (1)

Cleaning cassettee V8-25 CLH - 1 No.

Contd.../-

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Operation manual 1 No.

3 CCD Camcorder EVW - 327 P 1 No.

With zoom lens VCL - 712 BX.

With supplied accessories.

3. DESK TOP EDITOR

EVO 9700 2 Nos.

With Recorder/Player

It is with assemble

Insert editing alongwith supplied accessories:

Editing controller : RM-E9700 - 1 No.

Title keyboard : KI-9700P - 1 No.

Cleaning video cassettee : V8-25CLH - 1 No.

Video/audio cable : VMC .710M - 1 No.

Plug adaptor : Phono to BNC

Mini plug to extra mini plug - 1 No.

PAUSE/CONTROL adaptor - 1 No.

AC Power card : 3 Write grounded - 1 No.

Operation manual - 1 No.

Minor 14' Monitor PVM 1440 dm - 2 Nos.

4. Video cassettae. Recorder/Player EVO 9500 for previowing and dubbing purpose - 2 Nos.

14 " Monitor PVM 1440 dM - 2 Nos.

5. Editing suite for Post Production - 1 Set

EVO 9800 1 No.

EVO 9850 1 No.

DME 450P 1 No.

RM 450CE (Editor)- 1 No.
14" Monitor PVM 1440 dm - 2 Nos.
complete with

Contd.../-

Connecting cable for audie, videe and synth etc.

6. Lighting kit — 2 Set

7. Audie Mixer — 2 Nos.
   4 channels (Local) mono

8. Microphones
   Assertments — 8/10 Nos.

9. Addie power amplifier and 1/s — 1 set

10. Teels
    Kit containing screwdriver, seldering iron, outter, noseplier, twizer etc. — 2 Sets

11. Audie cassette Recorder/Player — 2 Nos.

12. Consumables

    i) Hi8 Videe Cassette tapes — 50 Nos.
    P5-60 HMEK
    P5-60 MMEK — 50 Nos.

    ii) Batteries back NP-77H — 12 Nos.
    Battery charger /AC Adopter — 2 Nos.

13. Power supply 30 KW lead apprex.

14. Voltage stablizer for studio 20 KVA one and equipment.

Contd..../-

5:2:4(74)

High Quality video studio for Universities as a Lab for Graduate level education.

1. Studio floor area minimum 30' x 40' , 15 to 18 ft. ht. studio to be accoustically treated.

   Sound proof entrance, this has not to be in a multi storeyed structure otherwise sound noise transfer takes place.

   Airconditioned with low noise.

2. Control Room by its side or nearby size 15' x 25', airconditioned with low noise.

3. Power supply, and standby P.S. arrangement.

4. Equipment as under

   The equipment as envisaged is of high quality but of low cost. Since the system envisaged for outdoor and editing has been on video Hi8. It is recommended to equip the studio with similar or higher grade Cameras of 3 CCD type.

A. STUDIO

(i)	Cameras portion type EVW 537 P alongwith Zoom lens adopter for independent Camera use and movable type. Camera cables view finder, communication head set etc.	3 Nos.
(ii)	Monitoring Amplifier Loundspeaker, Video Monitor.	1 Set
(iii)	Assortment of Microphones	10 Nos.
(iv)	Microphone stands, small & bigger	6 Nos.
(v)	Studio lights with lighting grid	25 Nos.
(vi)	Portable dimmer	1 No.
(vii)	Light stands	6 Nos.

B. CONTROLROOM

(i)	CCU for Camera	3 Nos.
(ii)	Vision mixer with special effects moderate quality SEG 2550 with Chroma keyer.	1 No.

Contd.../-

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(iii)	Video typewriter	1 No.
(iv)	Slide Projector with Camera	1 Set.
(v)	Audio Mixer 12 channel with Equalisation, headphone etc.	1 No.
(vi)	Cassette tape recorder/player(deck)	2 Nos.
(vii)	Audio Amplifier with L/S	1 Set.
(viii)	Studio Monitor B/W 6" or 9"	7 Nos.
(ix)	Output Monitor Colour 20"	2 Nos.
(x)	Preview Monitor PVM Series	
(xi)	VTR Hi8, EVO 9800 Player	2 Nos.
(xii)	VTR Hi8 EVO 9850	1 No.
(xiii)	Editing control unit RM 450 cE	1 No.

C. QUALITY CONTROL

(i)	Video selector swith 6 : 1	1 No.
(ii)	Audio selector switch 6: 1	1 No.
(iii)	Wafeform Monitor/vectorscope	1 No.
(iv)	Video Monitor 14" PVM Series	1 No.

D. PREVIEW FACILITY

Can be built separately as it is not advisable to block the control room or editing suite.

(i)	Recorder/Player EVO 9500	1 No.
(ii)	Monitor 14"	1 No.

E. SMALL WORKSHOP FACILITY

For maintenance of Electronics and Electrical equipment equipped with Tools, power supply, oscilloscope, video monitor, L/S etc.

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Annexure - A

B.Sc (Industrial Chemistry)

			Marks	L/Week
Ist year :	Paper I	Theory	70	5
	Paper II	Theory	70	5
	Paper III	Practical	60	4
			200	
2nd year :	Paper IV	Theory	70	5
	Paper V	Theory	70	5
	Paper VI	Theory	70	5
	Paper VII	Practical	90	4
			300	
3rd year :	Paper VIII	Theory	70	5
	Paper IX	Theory	70	5
	Paper X	Theory	70	5
	Paper XI	Practical	90	4
			300	52 L

To Marks alloted = 800

Maximum teaching load per teacher per week = 6.5 L

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JOB POTENTIAL OF VOCATIONAL PROGRAMME IN INDUSTRIAL CHEMISTRY

At present, graduates in Chemistry are being absorbed in several chemical industries as Chemists. They are not aware of the overall functioning of the industry, except some basic knowledge of chemistry. They are given on the job training and made to work as chemists. They are normally not able to rise very much in the organization. On the other hand, the graduates with Industrial Chemistry will be better suited for the job requirements in an industrial environment. As the course covers almost all the aspects of a chemical industry, these students will be suitable for any Department in Chemical industry, like, production, Q.C., product development, effluent treatment, etc. They will be better motivated and chances of going up in the organization will be much higher. The suggested course is for the most part, general in nature, and they could be absorbed in any Chemical Industry. The Students will be able to start or be employed in village industries based on agricultural raw materials or agrobased industries such as insecticides. They will also be suitable in Technical Marketing of Produce. They can be employed by the Government in Factory Inspectorate, Pollution Control agencies and other development agencies.

There is scope for them to be employed in Banks, Financial Institutions, etc, where their experience may be utilized in Project Appraisals for purposes of financing projects. Thus, a graduate in Industrial Chemistry will be a better motivated and more useful person in the Chemical Industries and allied Government and non-Governmental bodies. It is anticipated that there will be very good demand for these graduates.

NOTE ON SYLLABUS FOR INDUSTRIAL CHEMISTRY AT B.Sc. LEVEL

The practicals in Industrial Chemistry B.Sc course can be conducted in the present Chemistry undergraduate laboratories. At present, generally 40/60 students work in the laboratory and they are divided into two/three batches of 20 students each. The same strength may be maintained for the Ind.Chem. Course. The normal reagents, Chemicals and lab-wares provided to the Chemistry students are sufficient for Ind.Chem. students. Additional minor equipments required are given below semesterwise. No costly sophisticated equipments are required for the entire course.

First Year: 5;2:4(78)

Semester I - No additional equipments required

Semester II - Refractometer, Tensiometer/Stalgmometer, Polarimeter, Viscometer (Ostwald).

Demonstration Experiments : Different types of valves, Pipe fittings, Laboratory models of filters, dryers, impellers.

Second Year:

Semester I - Colorimeter, PH meter, potentiometer, conductometer, Dielectric Constant apparatus, Thermal conductivity measurement apparatus, Thermisters, Thermocouples, Transducers.

Semester II - Ignition point apparatus, flash point apparatus, Rotameter, Nesseler tubes.

Third Year:

Semester I - No additional equipments required.

Semester II - Special papers.

(a) Pharmaceuticals: Micrometer, vernier, Lab. oven for drying, Microscopes, Incubator, Autoclave, glasswares for microbiological testing.

(b) Heavy and Fine Chemicals: No additional equipments required.

(c) Petrochemicals :- Tensiometer, Viscometers, Rotameter, Manometer, Flash Point apparatus, Ignition Point apparatus, Pour point apparatus, Penetrometer, calcorimeter, Bomb Calorimeter, Oxygen cylinder.

(d) Waste recycling : Bomb Calorimeter, COD-Incubator.

(e) Agrochemicals :- No additional equipments required.

(f) Dyes :- Lab dyeing bath, Light sources, colorimeter, Fluorimeter.

(g) Polymers :- Viscometers, Dielectric constant apparatus, Tensile Strength apparatus.

Notes: 1. Some of the above equipments are available in the Physical Chemistry Laboratory. Hence, very few additional equipments will be needed to start the course. The equipments are not very costly.

2. As the course is a vocational course, the students should make factory visits and submit the report.

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PAPER - I

Max. Mark = 70

Unit = 1

Time 3 Hrs

Industrial Aspects of Organic Chemistry

Nomenclature : generic names, Trade names.

Raw materials for Organic Compounds : Petroleum: Natural gas, fractionation of crude oil, cracking reforming, hydroforming, isomerisation.

Coal : Types, structure, properties, distillation of coal, chemicals derived therefrom.

Renewable natural resources : Cellulose, starch-properties, modification. important industrial chemicals derived from them, alcohol and alcohol based chemicals, oxalic acid, furtural.

Books

1. Coal Conversion, E.J.Hoffman, The Energon Co., Lavamic, Wyoming, U.S.A.
2. Introduction to petroleum chemicals, H. Steiner, Pergamon Press.
3. From Agrocarbons to petrochemicals, L.F.Hatch and S.Matarm, Gulf Publishing Co., Houston.
4. Cotton-Cellolose : Its chemistry and Technologyh, Hall A.G.
5. Methods in Carbohydrate Chemistry, Vol.3 - Cellulose, Whistler, R.L.
6. Chemistry of Cellulose, Heuser, E.
7. Chemistry and Industry of Starch, Kerr, R.W.
8. Modified Starches : Properties and Uses, Wurzburg O.B.

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Unit - II : Industrial Aspects of Inorganic Chemistry

Basic metallurgical operations : Pulverisation, Calcination, Roasting, Refining.

Physicochemical principles of extraction of : Iron, copper, Lead, Silver, Sodium, Aluminium, Magnesium, Zinc, Chromium.

Inorganic materials of industrial importance : Their availability, forms, structure and modification, alumina, silica, silicates, clays, mica, carbon, zeolites.

BOOKS

1. Aerosol Sceince & Technology, Shephers, H.R.
2. Catalysis : Heterogeneous and Homogeneous, Delmon, B. and Janner, G.
3. Catalysis : Science & Technology, Anderson J.
4. Catalysis in micellar and macromolecular systems Fendler J. and Fendler E.
5. Catalysis in Theory and Practice, Rideal, E.K. and Taylor, H.S.
6. Phase Transfer Catalysis, Principle and Techniques, Starles, C.
7. Surface Chemistry, J.J.Bikermann, Academic Press.
8. Physical Chemistry of Surfaces, A.W.Adamson.
9. Catalysis: Heterogeneous and Homogeneous, Delmon, Elsevier Science Publisher.

Unit - III : Industrial Aspects of Physical Chemistry

Surface Chemistry and Interfacial Phenomena: Adsorption isotherm, Sols, Gels, emulsions, Microemulsions, Micelles, Aerosols, Effects of Surfactants, Hydrotropes.

Catalysis: Introduction, Types - Homogeneous and Heterogeneous, Basic Principles, Mechanisms, Factors affecting the performance, Introduction to Phase transfer catalysis, Enzyme catalysed, reactions - Rate model, industrially important reactions.

BOOKS

1. Principles of extractive metallurgy, Herbashi, Vol. 1, 2
2. Theory of mettallurgical processes, Volsky A and Sergievskaya, E.
3. Textbook of metallurgy, Baiky A.R.
4. Clays, H.Ries, John Wileys and Sons
5. Theory of metallurgical processes, Fillipov, Mir Publication
6. Unit Processes of Extractive Metallurgy, Pehlke, Elsevier Publication
7. Industrial Chemistry, Riegel, Reinhold Publication

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PAPER - II

Max. Marks: 70 Time : 3 Hrs.

Unit - I : Material and Energy Balance

Dimensions and Units :- Basic chemical calculations - Atomic weight, molecular weight, equivalent weight, mole, composition of - (i) liquid mixtures, and (ii) gaseous mixtures.

Material balance without Chemical reactions :- Flow diagram for material balance, simple material balance with or without recycle or by-pass for chemical engineering operations such as distillation, absorption, crystallisations, evaporation, extraction, etc.

Material Balance involving Chemical reaction : Concept of limiting reactant, conversion, yield, liquid phase reaction, gas phase reactions, with/without recycle or by-pass.

Energy Balance :- heat capacity of pure gases and gaseous mixtures at constant pressures, sensible heat changes in liquids, enthalpy changes.

BOOKS

1. Stoichiometry, B.I. Bhatt and S.M.Vora
   Tata McGraw-Hill Publishing Company Ltd., New Delhi
2. Chemical Process Principals - Part one,
   O.A. Hougen, K.M.Watson, R.A.Ragatz
   Asia Publishing House, Bombay

Unit -II Unit Operation in Chemical Industry

Distillation:- Introduction, batch and continuous distillation, separation of azestropes, plate columns and packed columns.

Absorption :- Introduction, equipments packed columns, spray columns, bubble columns, packed bubble columns, mechanically agitated contractors.

Evaporation:- Introduction, equipments - short tube (standard) evaporator, forced circulation evaporators, falling film evaporators, climbing film (upward flow) evaporators, auped (agitated) film evaporator.

Filtration :- Introduction, filter media and filter aids, equipments - plate and frame filter press, nutch filter, rotary drum filter, sparkler filter, candle filter, bag filter, centrifuge.

Drying :- Introduction, free moisture, bound moisture, drying curve, equipments - tray dryer, rotary dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.

Crystallization:- Introduction: solubility, supersaturation, nucleation, crystal growth. Equipment - tank crystallizer, agitated crystallizer, evaporator crystallizer, draft tube crystallizer.

Extraction :- Introduction: selection of solvents. Equipments - spary column, packed column, rotating disc column, mixer settler.

Mixing :- Introduction - mixing of liquid-liquid, solid-solid, liquid-solid systems.

BOOKS 5:2:4(82)

1. Introduction to chemical Engineering,
   W.L. Badger and J.T. Banchero
   McGraw-Hill Book Co. U.S.A.

2. Unit Operations in Chemical Engineering
   W.L.McCabe and J.C.Smith
   McGraw-Hill Book Company, New York.

3. Chemical Engineers' Handbook
   J.H.Perry, McGraw-Hill Book Co., New York

4. Unit Operations - I and II D.D. Kale
   Pune Vidyarthi Griha Prakashan, Pune.

Unit - III : Utilities and Fluid Flow and Heat Transport in Industry

Utilities in chemical industry:

Fuel:- Types of fuels - advantages and disadvantages combustion of fuels, calorific value.

Specification for fuel oil:

Boilers:- Types of boilers and their functioning.

Water :- Specification for industrial use, various water treatments.

Steam:- Generation and use

Air :- Specification for industrial use processing of air.

Fluid flow:- Fans, blowers, compressors, vacuum pump, ejector pumps: Reciprocating pumps, gear pumps, centrifugal pumps.

Heat Transfer:- heat exchangers - shell and tube type: fined tube heat exchangers, plate heat exchangers, refrigeration cycles.

BOOKS

1. Introduction to Chemical Engineering,
   W.L.Badger and J.T.Banchero
   McGraw-Hill Book Co. U.S.A.

2. Unit Operations in Chemical Engineering
   W.L.McCabe and J.C.Smith
   McGraw-Hill Book Company, New York

3. Chemical Engineers' Handbook
   J.H.Perry, McGraw-Hill Book Co., New York

4. Unit Operations - I and II D.D.Kale
   Pune Vidyarthi Griha Prakashan, Pune

5. Standard Handbook of Plant Engineering Editors;
   R.C.Rosaler and J.O.Rice McGraw- Hill Book Co.,

PAPER-III 5:2:4(83)

Max., Marks= 60

PRACTICALS

Simple laboratory techniques : Crystallisation, fractional crystallization, distillation, fractional distillation, boiling point diagram.

Extraction Process:- Phase diagram, partition co-efficient.

Preparation of Standard Solutions:- primary and secondary standards, determination of H_2SO_4 and H_3PO_4 in a mixture.

Calibration of thermometers:- Acquantance with safety measures in a laboratory:
Hazards of chemicals.
Depression and elevation in b.p/m. of solids and liquids.

Chromatography :- column, paper, thin layer.

Ore analysis:- Dolomite, limestone, calcite, analysis of alloys such as cupronickel.

Determination of Physical Constant:- Refractive index, surface tension, (effect of surfractants on surface tension), viscosity-fluids,polymer solutions, effect of additives on viscosity, optical rotation.

Stdy experiments/demonstration experiments.

PAPER - IV

Max.Marks = 70 Time 3 Hrs.

Unit-I : Material Science

Mechanical properties of materials and change with respect to temperature.

Materials of constructions used in Industry.

Metals and Alloys:- Important metals and alloys: iron,copper,aluminium, lead, nic el, titanium and their alloys -Mechanical and chemical properties and their applications.

Cement:- Types of cement, composition, manufacturing process, setting of cement.

Ceramics:- Introduction: Types, manufacturing processes, applications, refractories.

Polymerics Materials:- Industrial polymer and composite material -their constitution, chemical and physical properties, industrial applications.

Glass:- Types, composition, manufacture, physical and chemical properties, applications.

Corrosion:- Various types of corrosion relevant to chemical industry - Mechanism, preventive methods.

BOOKS 5:2:4(84)

1. Science of Ceramics Chemical processing, Hench L.L.
2. Chemistry and Physics of clays other ceramics
3. Science of ceramics, Stewart, G.H.
4. Chemistry of cement
5. Properties of glass, Morey, G.W.
6. Chemistry of glasses, Paul, A.
7. Corrosion: Causes and prevention, Spellur, F.N.
8. Corrosion and Corrosion engineering
   Fontana M.G. and Green N.D., Mc-Graw Hill Book Co.
9. Experiments in Materials Technology, a Laboratory Text for Engineers, Manufacturing metallurgy and materials testing, Govt.of India; East West Publication.
10. Selecting Materials for Process Equipment
    Mc Maughton K.J., Mc-Graw Hill Book Co.

Unit - II : Unit processes in Organic Chemical Manufacture -I

Nitration :- Introduction: Nitrating agents, kinetics and mechanism of nitration.

Processes such as nitration of:

i) Paraffinic hydrocarbons

ii) Benzene to nitrobenzene and m-dinitroben-zene

iii) Chlorobenzene to o- and p-nitrochloro benzenes

iv) Acetanilide to p-nitroacetanilide

v) Toluene

Continuous vs batch nitration.

Halogenation: Introduction - Kinetics of halogenation reactions, reagents for halogenation, halogenation of aromatics - side chain and nuclear halogenations, commercial manufactures- Chlorobenzenes, chloral, mono-chloracetic and chloromethanes, dischlorofluoromethane.

Sulphonation: Introduction - sulphonating agents, chemical and physical factors in sulphonation, kinetics and mechanism of sulphonation reaction, commercial sulphonation of benzene, naphthalene, alkyl benzene, batch vs continuous sulphonation.

BOOKS

1. Unit Process in Organic Synthesis
   P.M.Groggins,McGraw-Hill Book Co.,New York

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PAPER - V

Max.Marks= 70 Time : 3 Hrs.

Unit - I : Unit processes in Organic Chemicals Manufacture - II

Oxidation:- Introduction - Types of oxidation reactions, oxidising agents, kinetics and mechanisms of oxidation of organic compounds, liquid phase oxidation, vapor phase oxidation, commercial manufacture of benzoic acid, maleic anhydride, phthalic anhydride, acrolein, acetaldehyde, acetic acid.

Hydrogenation:- Introduction - Kinetics and thermodynamics of hydrogenation reactions, catalysis for hydrogenation reactions, hydrogenation of vegetable oil, manufacture of methanol from carbon monoxide and hydrogen, hydrogenation of acids and esters to alcohols, catalytic reforming.

Alkylation :- Introduction - Types of alkylation, alkylating agents, thermodynamics and mechanism of alkylation reactions, manufacture of alkybenzenes (for detergent manufacture), ethylbenzene, phenl ethyl alcohol, N-alkyl anilines (mono and di-methyl and ethyl anilines).

Esterification:- Introduction - Hydrodynamics and kinetics of esterification reactions, Esterification by organics acids, by addition of unsaturated compounds, esterification of carboxy acid derivaties, commercial manufacture of ethylacetate, dioctyl phthalate, vinyl acetate, cellulose acetate.

Animation: (A) By reduction : Introduction - Method of reduction - metal and acid, catalytic, sulfide, electrolytic, metal and alkali sulfites, metal hydrides, sodium metal, concentrated caustic oxidation, reduction, commercial manufacture of aniline, m-nitroaniline, p-amino phenol.

(B) By aminolysis: Introduction - aminating agents, factors affecting.

Hydrolysis: Introduction - hydrolysing agents, kinetics, thermodynamics and mechanism of hydrolysis.

BOOKS

1. Unit Processes in Organic Synthesis, P.H.Groggins, McGraw-Hill Book Co., New York.

Unit - II Pollution

Air, oxygen, nitrogen cycle, water, biosphere, flora and fauna, energy, soil.
Pollutants and their statutory limits.
Pollution evaluation methods.
Air Pollution, various pollutants.
Water pollution-organic/inorganic pollutants.
Noise pollution
Sewage analysis
Pesticide pollution
Radiation pollution, green house effect, future -

BOOKS

1. Pollution control in chemical and allied industries, Mahajan S.P.
2. Pollution control in industries. A series of books by Jones H.R.
3. System's Approach to Air Pollution Control, R.J.Bibbero and I.G.Young.
4. Air Pollution-Vol.I-IV Editor, A.C.Stern, Academic Press, New York
5. Gas Purification Process for Air Pollution Control, G.Nonhebel Newnes-Butterworths, London
6. Air Pollution Technology, Painter D.E., Reston Publishing Co.

PAPER - VI 5;2;4(86)

Max.Marks = 70 Time : 3 Hrs.

Unit - I: Effluent treatment and waste management

Principles and equipments for aerobics, anaerobic treatment, adsorption, filtration, sedimentation.

Bag filters, electrostatic precipatator, mist eliminators, wet scrubbers
Absorbers: solid waste management, industrial safety.

BOOKS

1. Effluent Treatment in Process Industries- Inst. of Chem.Engg
2. Effluent Treatment and Waste disposal - Inst.of Chem.Engg.
3. Effluent treatment and disposal - Inst.of Chem.Engg.
4. System's Approach to Air Pollution Control, R.J.Bibbero and I.G.Young.
5. Air Pollution-Vol.I-IV Editor, A.C.Stern, Academic Press,New York.
6. Gas Purification Process for Air Pollution Control, G.Nonhebel Newnes-Butterworths, London.
7. Air Pollution Technology, Painter D.E., Reston Publishing Co.

Unit - II Process Instrumentation

Concept of measurement and accuracy : Principle, construction and working of following measuring instruments.

Temperature: Glass thermometers, bimetallic thermometer pressure,spring thermometer, vapour filled thermometer, resistance thermometers,radiation pyrometers.

Pressure:- Manometers, barometers, bourbon pressure gauge, bellow type, diaphragm type pressure gauges, macleod gauges, Pirani gauges, etc.

Liquid level:- Direct-indirect liquid level measurement, float type liquid level gauge, ultrasonic level gauges, bubbler system.

Density measurement
Viscocity measurement.

BOOKS

1. Industrial instrumentation D.P.Eckman, John-Wileys & Sons.
2. Applied Instrumentation in Process Industries, Vol. i, II & III W.G.Andrews, Gulf Publication
3. Instrumentation and Control for the process industries. S.Borer, Elsevier Applied Science Publishers.
4. Chemical Engineers' Handbook. J.H.Perry and D.Greenb, McGraw-Hill Publishing Co., New York.

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PAPER - VII

Max.Marks = 90

PRACTICALS

Unit process :- One to two example of each of the following unit processes.

Nitration, sulphonation, friedel-crafts reaction, esterification, hydrolysis, oxidation, halogenation, chlorosulphonation, reduction, polymerization, reactions of diazonium salts.

Instrumental methods of analysis:- Use of colourimeter, PH meter, potentiometer, conductometer, refractometer, polarimeter.

Material testing:- testing of alloys, identification of plastics/rubber estimation of yield point, Young modulus flaredness, optical, thermal mechanical and electrical properties.

Process instrumentation - transducers of different types.
Use of transducers for measuring flow control.
Determination of flash point and ignition points liquids.

Water analysis: Solid content, hardness, COD, and other tests as per industrial specifications.
Flow measuring devices- Floats.
Monographs of representatives raw materials such as sulphuric acid, toluene, sodium carbonate, sodium hydrooxide, carbon tetrachloride, Benzoic acid. (5-6 compounds) limit tests for heavy metals Pb,As,Hg,Fe, and ash content.

PAPER - VIII

Max.Marks = 70 Time:3 Hrs

Unit - I : Chemical Process Economics

Fators involved in project cost estimation, methods employed for the estimation of capital investment.
Capital formation, element of cost accounting.
Interest and investment costs, time value of money - equivalence.
Depreciation, methods of determining depreciation, taxes.
Some aspects of marketing, pricing policy, profitability criteria, economics of selecting alternatives.
Variation of cost with capacity, break even point, optimum batch sizes, production scheduling, etc.

BOOKS

1. Economics of Chemical Industry, Hempel.E.H.

Paper II

Industrial Organisation

IC 302	Concept of scientific management in Industry;	4 L
	Functions of management, decision making, Planning, organising, directing and control;	9 L
	Location of Industry;	3 L
	Materials management;	5 L
	Inventory control;	4 L
	Management of human resources-selection, incentives welfare and safety.	5 L

BOOK

1. Industrial Organization and management, Bethel L.L.

5;2.4(88)

Max.Marks = 70 PAPER -IX Time: 3 Hrs.

Unit - I: Industrial Chemical Analysis:

Indistrial Analysis:

Sampling procedures, sampling of bulk materials, techniques of sampling solids, liquids and gases, collecting and processing of data chromatography, paper chromatography, TLC, GLC,HPLC, particle size determination.

Rheological properties of liquids, plastics and their analysis.
Modern instrumental methods of analysis
UV - visible spectroscopy
TR - spectroscopy and non-depressive TR
NMR- spectroscopy
Atomic Absorption, Flame photometry
Nelitron diffraction
X - ray fluoroscence
Ion - selective electrodes
Ion - chromatography.

Unit - II : PHARMACEUTICALS

Historical background and development of pharmaceutical industry in India in brief.
Pharmacopocias _ Development of Indian pharmacopocia and introduction to B.P., U.S.P., E.P., N.F., and other important pharmacopocias.

Introduction to various types of formulations and roots of administration. Aseptic conditions, need for sterilisation, various methods of sterilisation.

Various types of pharmaceutical excipients - their chemistry, process of manufacture and quality, specifications - glidants, lubricants, diluents, preservatives, antioxidants, emulsifying agents, coating agents, binders, colouring agents, flavouring agents, gelatin and other additives, sorbitol, mannitol, viscosity builders etc.

Surgical dressings, sutures, ligatures - with respect to the process, equipments used for manufacture, method of sterilization and quality control.

Pharmaceutical Packaging :- Introduction, package selection, packaging materials, ancillary materials, packaging machinery, quality control of packaging materials.

PAPER - X

Max.Marks= 70 Time: 3 Hrs.

Unit - I : FDA, important schedules and some legal aspects of drugs.

Phytochemicals:- Introduction to plant classification and crude drugs, cultivation, collection, preparation for the market and storage of medicinal plants.
Evaluation of crude drugs - Moisture contents, extractive value,volatile oil content, foreign organic matter. Quantitative microspopic exercises, including of starch, leaf content (palisade ratio,stomatal number, and index vein islet number and vein termination number) crude fibre c ntent, introduction to chromatographic method of identification of crude drugs.

Chemical Consultation of Plants:- Including carbohydrates, amino acids, proteins, fats, waxes, volatile oils, terpenoids, steroids, saponics, flavonoids, tannins, glycosides, alkaloids.,

Various isolation procedures for active ingredients with example for alkaloid, e.g., vincaalkaloids, reserpine, one for steroids-sapogenin, diosgenin, diagroh.

Pharmaceutical quality control (other than the analytical methods covered under core subject) sterility testing,hydrogenic testing,glass testing, bulk density of powders, etc.

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Unit - II : Classification of various types of drugs with examples

Raw materials, process of manufacture, effluent handling, etc., of the following bulk drugs.

(i) Sulpha drugs - Sulphaguandine, sulphamethoxazole
(ii) Antimicrobial- Chrloromphenicol, furazolidine, mercurochrome, esoniazid, Na-PAS.
(iii) Antalgesic - antiinflammatory - salicycle acid and its derivatives, iuprofen, mefenamic acid.
(iv) Steroidal hormones- Progesterone, testosterone, methyl testosterone.
(v) Vitamins - vit A, Vit.B6, Vit. C
(vi) Barbiturates- Pentobarbital
(vii) Blockers - Propranolol, atenolol
(viii) Cardiovascular agent - Methyl dopa
(ix) Antihistamins - Chloropheneramine maleate

Products based on fermentation processes - brief idea of micro-organism, their structure, growth and usefulness, Enzyme systems useful for transformation, microbial products.

General principle of fermentation processes and product processings

Manufacture of antibiotics - Penicilin - G and semisynthetic penicillins, Rifamycin, tetracyclines vit. B_{12},

Biotransformation processes - for predinisolone, 11 - hydroxylation in steriods. Enzyme catalysed transformation manufacture of ephidrine.

PAPER - XI

Marks 90 Practicals

Industrial Analysis - Analysis of common raw materials as per the industrial specifications, such as phenol, aniline, formaldehyde, hydrogen peroxide, acetone, epoxide, olefins, oils, etc.

Synthesis of common industrial compounds involving two step reactions for example 4 Bromoaniline, 3 nitroaniline, Sulphanilamide, 4 Aminobenzoic acid, 4 Nitrobenzoic acid, Dihalobenzenes, Nitrohalobensenses.

Demonstration of various pharmaceutical packaging materials, Quantity control tests of some materials. Aluminium strips, cartons glass bottles.

Limit tests for Chlorine, heary metals, arsenic, etc. of two representative bulk drugs.

Demonstration of various pharmaceutical products.

Active ingredient analysis of few types of formulations representing different methods of analysis - Acidemetry, Alkalimetry, Nonaqueous complexometry, potentiometry etc.

Determination of sulphate ash, loss on drying and other tests of bulk drugs, complete I P monograph of three drugs representing variety of testing methods.

Evaluation of crude drugs - Microscopic examination. Determination and identification of starch grannules, calcium oxolate.

Palisate ratio, stomatal index determination. Identification of few drugs. TLC method for identification.

Microbiological testing - Determination of MIC of some antibacterial drugs by zone/cup plate methods.

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BOOKS

1. Practical Pharmacognocy
   By T.B.Wilis,
   Practical Pharmacognocy, by T.N.Vassudevan.

2. Modern Pharmacognocy
   By Ramstad., McGraw Hill

3. Indian Pharmacopoea 1985

4. British Pharmacopoea 1990
   Handbook of Drugs and Cosmetic Acts
   By Mehrotra

5. Pharmaceutical Excipients.

6. Pharmaceutical Dosage forms

7. Principles of Medicinal Chemistry, W.O. Foye; Lea and Febigen, Publication, Philadelphia.

8. Text Book of Organic Medicinal and Pharmaceutical Chemistry Wilson, Gisvold, Derge; Lippinett-Toppan.

9. Essentials of Medicinal Chemistry - Korolkoyas and Burkhatter, Wiley-Interscience.

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Annexure - B

St. Anthony's College: Shillong.

SUMMARY OF THE SYLLABUS
BIOTECNOLOGY

			Marks
1st year			
Paper I	Biochemistry		70
II	Maths & Computers	- 35	
	Biophysics	- 35	70
III	(Practical) Biochemical Techniques		60
	(Job training in clinical pathology/X ray Sonography clinic)		20
2nd year			
IV	Microbiology	- 35	
	Cell Biology	- 35	70
V	Molecular biology	- 35	
	Genetics	- 35	70
VI	(Practical) Methods of Cellular & Molecular biology		60
VII	Microbiological Technique Job training in Laboratories/Clinics/ Institutions for body fluid culture, production of vaccine		20
3rd year			
VIII	Immunology	- 25	
	Recombinant DNA technology	- 45	70
IX	Plant Biotechnology	- 50	
	Environmental Biochemistry	- 20	70
	(Practical)		
X	Culture methods		60
XI	Immonological Methods		30
XII	Project work under chosen faculty		50
	Enterpreneurship, Theory & Practice in a project draft		50
			800

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1st Year BIOCHEMISTRY Paper I Marks 35

1. Nature of biological materials.
2. General properties of organic and inorganic compound.
3. Suitability of organic compounds for generation ofstructure, storage of energy, and information.
4. Hydrophilic and hydrophobic groups in biological molecules.
5. Classification of biomolecules based on the role in bio-process.

   i Molecules involved in generation of mechanical stability- peptidoglycans, polysaecharides and membrane lipids.

   ii Molecules involved in ~~fx~~ information storage and retrieval- the nucleic acids.

   iii Molecules executing mediator and catalytic function- the proteins.

   iv The signal molecules

   v Perspective of biological macromolecules: The repeating units nucleic acids and proteinsHelicity, bending, lupping, pleats, salt bridges etc and their determinants. The basis for inter-molecular interaction e.g. enzyme- substrate and antigen-antibody recognition. Nature of biochemical reactions underlying bio-synthesis and degradation. Role of enzymes in such reactions. Proteins and non-protein enzymes. Kinetics of enzymes catalyzed reactions.

In vitro activity of purified enzymes and the ir applications in industry. Various uses of enzymes - enzyme is food processing, medicines, diagnostics and production of new compounds.

Enzymes as research tools - ELISA methods, modifications of biological compounds with the help of enzymes.

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Paper II SECTION-A MATHS AND COMPUTERS MARKS 35

1. The set theory properties of sub sets.
2. Linear and geometric functions. 3. The binomial theorem.
4. Limits of functions, derivatives of functions.
5. Logarithm 6. Differentiation. 7. Integration.
8. Probability calculations. 9. Methods of samplings, confidence level.
10. Measurement of central tendencies. 11. Measurement of derivations.
12. Computers : General introduction to computers, organization of computers digital and analogue computers, computer algorithm.
13. Computer in or line monitoring and automation.
14. Application of Computers in co-ordination of a fermentar in operation.
15. Demonstration of the above utilities.

SECTION - B BIO-PHYSICS

1. Energetic of a living body. Sources of heat limits to temperature. Heat dissipation and conservation.
2. Lambert Beer Law. Spettrophotometry and colorimetry. Phototosynthesis.
3. Strategies of light receptions in microbed, plants and animals.
4. Correction of vision faults.
5. Electrical properties of biological compartments. Electricity and potential signal.
6. Generation and reception of sonic vibration hearing aides.
7. Intra- and intermolecular interactions in biological systems. Spatial and charge compatibility as determinant of such interactions.
8. Physical methods applied to find out molecular structures.

X-Ray Crystallography and NMR

9. General spectroscopy - uv - vis, fluorescence, automic absorption IR, Raman Spectra.
10. Physical methods of imaging intact biological structures: ultra sound, optical filters, X-Ray, CAT Scan, E C G, E E G, N M R imaging.

Paper III(Practical) BIOCHEMICAL TECHNIQUES MARKS 60

Quantitative estimation of the following biological samples.

1. Sugar in given solutions.
2. Sugar in biological samples.
3. Extraction and seperation of lipids.
4. Estimation of proteins.
5. Estimation of DNA/RNA
6. Isolation and purification of proteins.
7. Assay of enzyme activity.
8. Kinetic studies of enzyme.
9. Chromotographic methods for seperation of macromolecules.

(Job training for 30 days in chemical pathology/X-Ray/Sonography Clinic)
Marks - 30.

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2nd year paper iv Microbiology Marks 35

1. Develc ment of microscopy (OPtical TEM &SEM)
2. Pasteur's exp ts. disproving spontaneous generat on.
3. The concept of sterilization. Methods of sterilization, (Dry heat, wet heat, radiation, chemical and fil-tration etc)
4. Concept of microbial species and strains.
5. The various forms of microorganisms -PPLOs, COCCI, bacilli and spirilla
6. Genetic homogeneity in clonal populations.
7. Spontaneous and induced variation arising in microbial population
8. Gene transfer in microorganisms.
9. Nature of the microbial cell surface. Gram positive and gram negative bactreria. Kind of glagella. Sceotypes.
10. Prokaryotin and Eukaryotic microbial cells.
11. Nutritional classification of microorganisms.
12. Microbes in extreme environments- the thermophiles and alkalophiles
13. Pathogenic microorganisms. Defence mechanism against microorganism
14. Symbiosis and autibiosis among microbial populations.
15. N2- fixing micro bes in agriculture.
16. Microbial metabolism. Fermentation procucts. A survey of products form microorganisms. Strain improvement by enrichment, selection recombinant DNA methods.
Production of heterologous proteins of interest in microorganisms.

Section - B Cell Biology Marks 35

1. Cell as a basic unit of living systems. The cell theory.
2. Precellular evolution: artificial creation of "cells"
3. Boa-rd classification of cell types: PPLOS. bactreria, eukaryotic microbes, Plant and animal cells. A detailed classification of cell types within an organism cells, tissue, organ and organism as different level of organization of otherwise genetically similar cells.
4. Ecological amplitube of cells in high altitudes sediments, arctic, acid, hotspring and brackosh and fresh water environments.
5. Biochemical composition of cells (Proteins lipids, Carbodrates, nucleic acids and the metabolic pool)
6. Ultra syructure of the cell membrance
7. Structure and function of cell organelles; ultra structure of cell membranes, Cytosol, Golgibodies, endoplasmic reticulum, ribosoms, cytoskeletal structres (actin microtubules etc) Mitochondria Choloroplasts, Lysosomes, peroxysomes, nucleus (Nucleusmembranes, nucleoplasm, nucleolus, chromati).
8. Celldivision and cell cycle (incl. cell synchrony and its applications)
9. Cell-cell interaction
10. Cell-differentiation in plants and animals.

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Paper - V Section - A MOLECULAR BIOLOGY Marks 35

1. Molecular basisof life.
2. Structure of DNA
3. DNA replication both prokayotes and cukaryotess.
4. DNA reconbination molecular mechanisms prokaryotic and unkaryotic.
5. Insertion elements and transposons.
6. Structure of Prokanyotic genes.
7. Prokaryotic transcriptions.
8. Prokaryotic translation.
9. Prokaryoticgene expression (Lac, his, trp. catasotirepression).
10. Structure of Eukaryotic genes,
11. Eukaryotic transcription.
12. Eukaryotic translation
13. Eukanjotic gene expression transcription factor etc.
14. Gene expression in yeast.
15. Gene expression in protozoan parasites.
16. Gene organization and expression in Mitochondria/choloplasts.
17. Post translation regulation of gene expression.
18. Development and environmental regulation of gene expression.

SECTION - B GENETICS Marks 35

1. Nature of genetic material. Nucleic Acids. DNA replication.
2. Mendelian laws of inheritance, gene interaction.
3. Sex determination in plants and animals, Sex-linkage, non-disjunction as a proof of Chromosonmal theory of inheritance.
4. Linka-ge, mapping genes, interference, coincidence in pro-andenkaryotes
5. Chromosomes, chemical composition, structural organisation of chromatids, centromeres, telomeres, chromatin, nuclaosome organisation, eu-and heterochromatin, special chromosomes (eg polytene and lamp- brush chromosomes), banding pattern in human chromosomes.
6. Structural and numerical aberrations i nvolving chromosomes, evolution of wheat, cotton and rice, hereditary defects-Turner and down Syndromes.
7. Mutation- Spontaneous and induced Chemical and physical mutagenes induced mutations of plants, animals and microbes for economic benefits of man
8. Basic microbial genetics, conjugation, transduction, transformation, isolation, cfauxotrophs, replica plating techniques, analysis of mutations in biochemical pathways one geneenzyme hypotheses.
9. Extrachromosomal inheritance, mitochondial and chloroplast genetic systems.
10. Population genetics: Hardy Weinberg equilibruim, gene and genotypic frequencies.

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Paper VI (Practical) METHODS IN MOLECULAR ANDCELLULAR BIOLOGY Marks.35

1. Cytological preparetions:
   - Fixation, dehydration and staining.
   - Squash in stain.
   - Embedding and sectioning.
2. Cell counting methods:
   - The haema cytometer and ther aides.
3. Measurement with the help of light microscope.
   - Calibration of occular microscope
   - Finding out average cell size
   - Chromosome lenghts
4 Seperation of ce;; types (from blood)
5. Seperation og cell arganelles:

   Methods of lysis: rupture osmotic/chemical/Enzymatic lysis of cells followed by centrifugation, monitoring cell lysis by release of cellular material and by change in light scattering etc
6. Extraction of cellular materials.
   - Extraction in saline buffers
   - Extraction in solvents
   - Precipitation from extracts.
8. Thin layer chromatography of extracted material
9. Isolation of chromosomal and plasmid DNA from bacteria.

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Paper VII MICROBIOLOGICAL TECHNIQUE Marks 30

1. Aseptic technique 2. Cleaning glassware
3. Preparation of media, cotton plugging and sterilization
4. Personal Hygine - Microbes from hands tooth scum and other body parts.
5 Isolation of microorganisms frim air, water and soil camples. Dilution and pour plating. colony purification.
6. Enumeration of microorganisms. Total vs viable counts.
7 Identification of isolated bacteria. Gram staining and other staining methods metabolic characterization (eg IMVIC test)
8. Growth curve of microorganisms.
9. Antibiotic sensitivity of microbes. use of antibiotic discs
10. Testing water Quality.
11. Test fpr antibodies against given bacteria.
12. Culture from body fluids (Stool, Urine, Blood)
13. Alcoholic and mixed acid fermentation

(job training - in laboratories/clinic/institutions for body fluid culture, production of vaccine etc.

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3rd Year Paper VIII IMMUNOLOGY Marks 25

1. The immune systems and immunity with historical perspective
2. Antigen - antibody and their structure.
3. The organs and the cells of the immune system and their function.
4. Antigen-antibody interaction.
5. Humoral and cell mediated immunity (role andMUC and genetics restriction)
6. Origin of diversity in the immune system.
7. Effecter machanisms.
8. Immunity to infectious diseases, vaccines.

Section - B RECOMBINANT DNA TECHNOLOGY Marks 45

1. What is gene cloning and why do we need to clone a gene
2. Tools and techniques plasmids and other vehicles genemic DNA, handling of DNA RNA, cDNA, RT Enzymes and other reagents techniques.
3. Choice and selection of the tools and the techniques.
4. Vehicle: plasmids and bacteriophages, available phagemids, cosmids viruses.
5. Purification to DNAfrom bacterial, plant and animal cells.
6. Manipulation of purified DNA
7. Introduction of DNA into living cells
8. Cloning vectors for E Coli
9. Application of cloning in gene analysis
   - How to obtain a clon. ofaspecific gene
   - Studying gene location and structure
   - Studying gene expression.
10. Gene cloning and expression of foreign gene in research and .. biotechnology
    - Production of protein from clone genes
11. Gene cloning in medicine
    - Pharmaceutical compounds
    - Artificial insulin genes
    - recombinant vaccine
    - diagnostic reagents.

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Paper IX Section - A PLANT BIOTECHNOLOGY Marks 50

1. Introduction to in vitro methods. Terms and definitions use of growth regulators.
2. Beginning of in vitro cultures in our country (Ovary and avule culture, in in vitro pollination and fertilization.
3. Embryo culture, embryo rescue after wide hybridization and its application
4. Introduction to the processes of embryogenesis and organogenesis and their practical applications.
5. Clonal multiplications of elite species (Micropropogation) axillary bud shoo tip and meristem culture.
6. Haploid and their applications. Somaclonal variation and applications.
7 Endosperm culture and production of triploids.
8 Practical applications of tissue and organ culture (Summarizing the practical applications of all the above mentioned technique)
9 Single cell suspension cultures and their applications in selection of variants/mutants with or without mutagen treatment (Ofhaploid cultures preferable).
10 Intriduction to protoplast isolation: principles and applications.
11. Testing of viability of isolated protoplasts.
12. Steps in the regeneration of protoplast.
13. Somatic hybridizations - an introduction
14. Various methods for fusing protoplast-chemical, electrical
15. Use of markers for selection of hybrid cells.
16. Practical applications of somatic hybriddization (hybrids vs cybrids)
17. Use of plant cell, protoplast and tissue culture for genetic manipulation of plants. Introduction to A. Tumefacions.
18. Tumor formation of plants using Arhizogenes.
19 Root formation using A rhizogenes.
20. Practical application of genetic tranformation.

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Section - B ENVIRONMENTAL BIOTECHNOLOGY Marks 20

1. Renewable and nonrenewable resource

2. What is renewable should be bioassimilalle/biodigradable.

3 Conventional fuel and their environmental impacts
- Fire wood
- Plantand animal wastes
- Coal
- Gas
- Animal Oils

4. Modern fuel and their environmental impacts
- Methogenic bacteria & biogas
- Microbial hydrogen production
- Conversion of sugars to Ethanol. The gaschol experient.
- Solar energy co nverter -Hopes from the photosynthetic pigments

5. Biotechnological inputs in producing good quality natural fibre
- Transgenic sheeps & transgenic plants

6. Microbiological quality of food and water

7. Treatment of municipality wasteand industrial effluents

8. Degladation of pesticides and other toxing chemicals by microorganism

9 Thuringiensis toxin as a natural pesticide

10. Biological control of insects.

11. Enrichment of ores by microorganisms

12. Biofertilizers, Nitrogen fixing micro organism enrich the soil with assimilable nitrogen.

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Paper X (Practical) CULTURE METHODS Marks 60

1 Preparation of cultural media (2) Methods of embryo culture
3. Methods of inoculation in a Laminar flow
4. Growth of plant cells into undifferentiated mass
5. Large scale cultivation of plant cells, isolation of single cells.
6. Suspension cultures (7) Fusion ofcultured cells
8. Production of secondary metabolites (eg alkaloid, glylosides terperiod etc)

9. Clonal progogation and production of virus free plants.

Paper XI (Practical) Immunological Methods Marks 30

1. Purification of antigens (2) Purification of antibodies
3. Conjugation and labeling of antibodies
4. Generation of ascetic fluid (5) Diagnoses of an infections disease by an immunoassay.

Paper XII Section-A Project work Marks 50

The students will be assigned to generate data on certain research projects and/or compile available information from literature on a given topic of biotechnological relevant. The project will be under the supervision of chosen faculty member and span over a period of one Semester

Section - B ENTERPRENEURSHIP Marks 50

The student will be delivered lectures on how to select for a product line, design and develop process, economics on material and energy requirement, stock the product and release the same for marketing etc. In parallel the students will be asked to survey the demand for a given product, feasibility of its production under the given constraints of raw materials, energy imput, financial situation export potential etc. Procedural details on how to select process, how to move for loans, how to operate and how to repay the loans should be high lighted during the lectures. The semester should end with submission of a draft project by the student.

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MASS COMMUNICATION -VIDEO PRODUCTION

Semester Schedule

Sr. No.	Year	Sem/ Terms	Name of Paper	Lecture/ Practical	Total teaching load/wk	Exam Th. (Hrs)	Exam Prac. (Hrs)	Marks
1.	1	1	Introduction to Mass Communication a. Theory.....25 mks b. Practical....15 mks c. Int Assess...10 mks	3 / 3	6	2	3	50
2.	1	1	Visual Thinking a Theory.....25 mks b. Practical..15 mks c. Int Assess.10 mks	3 / 3	6	2	3	50
3.	1	2	Media Scene in India	3 / -	3	2	3	50
	1	2	Media appreciation a. Theory.....25 mks b. Practical.....15 mks c. Int. Assess...10 mks	1 / 3	4	-	-	
4.	1	2	Media Script writing a. Theory.....25 mks b. Practical.....15 mks c. Int.Assess.....10 mks	3 / 3	6	2	4	50
5	2	1	Sound for Media a. Theory.....50 mks b. Practical..15 mks c. Int Assess.10 mks	3 / 3	9	3	6	100
6.	2	1	Video for Communication a. Theory....50 mks b. Practical.30 mks c. Int Assess.20 mks	3 / 3	12	3	4	100
7	2	2	Video Studio a. Theory.....30 mks b. Practical.50 mks c. Int.Assess.20 mks	3 / 3	12	3	6	100
8.	3	1/2	Video Electronic Film production a. Theory....50 mks b. Project...160 mks c. Int.Assess.40 mks	3 /9	12	3	12	250
9	3	2	Enterpreneurship Marketing a. Theory....35 mks b. Int Assess.15 mks	3 / 3	6	3	-	50
								800

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MASS COMMUNICATION - VIDEO PRODUCTION

Paper I

Maximum Marks	:50	Time : 2 hours (Theory)
Theory	:25	3 hours (Practical)
Practical	:15	
Int. Assessment	:10	

INTRODUCTION TO MASS COMMUNICATION

UNIT 1 : Concepts and Theories — 15 periods

Communication concepts : Definition and terms.

Communication media as the extensions of man.

Process of Communication :

Elements of the process - models of communication process :

1. The Lasswell Formula
2. Shannon and Weaver's
3. Osgood and Schramm's
4. Dance and Berlo
5. Gerbner's model - The 'Z' diagram
6. Newcomb's ABX model
7. 'Balance' models
8. Westly and Maclean's models for communication research
9. Sociological model of Riley and Riley
10. Maletzke's model of the Communication process
11. Five Star and Circular models

Functions of Mass Communication :

Content functions (related to contents/message of medium)

Medium functions (related to the very medium)
Manifest functions - The obvious functions
Latent functions - hidden and subconscious functions

Intended functions vs unintended functions
The Dissonance theory

Societal Functions : maintain stability, bring about economic, social, cultural changes, usage by government and vested interests,

Lasswell's conception of societal functions - surveilance of the environment - transmission of the social inheritance - Dysfunctions associated with Mass communation

Lazarsfeld and Merton's conception functions - Status conferral, enforcement of the social norms, narcotising dysfunction - servicing the political system - facilitation of social cohesion - Interpreting the society to itself - servicing the economic system - Integration of new residents into a community.

(Contd. . .)

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Individual functions: Education, Information, entertainment, gratification - surveilance or information seeking (guiding our behaviours, guiding our understandings) - developing a concept of self exploring reality, aiding our comparisons and contrasts) - as professional tools - facilitating social interaction, substituting for social interaction, providing relaxation, diversion, emotional release enjoyment, stimulation, or respite from boredom, aiding escape from tensions and alienation and ritualizing daily living to give us a sense of order and security.

Types of Communication

Intra personal (within oneself); inter personal (between two people); Group communication (among groups of persons); At the mass level in which the audience is 'large heterogeneous and widely dispersed- Mass communication.

The Barker - Wiseman and Barlund Intra Personal communication models. Interpersonal communication - transaction and interaction - advantages of interpersonal communication(helps to form & present identities - helps to fit into society and ward of loneliness, boredom, ineffectiveness - assists in accomplishing one's goals with others - helps to identify and follow rules of social interaction) Development of skills in interpersonal communication - planning, adaptation and execution, evaluation skills - owning responsibility.

Group communication - Informal group setting - formal settings - leadership & leadership styles - Proxemes and other non-verbal interactions.

Mass Communication - printing press, wireless telegraphy, radio, photography, cinema, television, Cable and Satellite TV, Video computer, telematics and informatics.

Relevance of communication theories to practice- understand media patterns (distribution, frequency, emphasis, repetitiveness, organization and context).

The 'GROUND' and the 'FIGURE'-MEDIUM is the ground and the MESSAGE is the figure - Communication break down at any of its various stages, viz., SENDER, MESSAGE, CHANNEL, RECEIVER, FEEDBACK(EFFECTS).

The MOSAIC concept of multilayered communication - the four dimensional view - the Individual's path through the Mosaic and the way he fills the gaps in the mosaic and makes his own meaning.

Impact and ffects of mass communication :
Complexity of media effects - Different ways in which the media "cause" effects - sources of media impact - variable effects -levels of media effects - explanations of effects: Modeling theory-Identification theory-Arousal theory-script theory-cultivation theory-cultural invasion theory-spiral of silence theory-agenda setting theory-consistency theory-political economy theory -systems theory.

Media impact on our lives - positive or negative?

Interconnection of mass communication activities

Mass communication as social institutions-Normative Theories:Authoritarian normayive theory-Free Press normative theory-social responsibility normative theory-Soviet media theory-Development media theory -Democratic participant media theory

The importance of mass communication:
Connecting to "reality" through mass media-media constructs reality-a WINDOW, an INTERPRETER, a PLATFORM, a SIGNPOST, a FILTER, a MIRROR, a SCREEN. "Reality" and media content - media and divergence from "reality"

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Cultural content of mass communication vs mass communication inducin a new culture.

Social impact of new mass communication technologies

Mass media as instruments of power, control-who controls the mass me

Access to mass media on what terms?

Mass communication issues -children taken for granted, women stereoty violence unduly excessive, cheap sex, low status of minorities, over r presentation of elite, event bias, International news bias, dominant themes that have become cliched

UNIT 2 : Communication Techniques 15 periods

Sender, message, channel, receiver and feedback skills and techniques Writing, reading, interpreting skills-talking and listening skills Feedback and evaluation of communication effect- stimulus response models-psychological models of TV effects on individual behaviour (Com stock) -Katz and Lazarsfeld's two-step flow model of mass media and pers nal influence-Rogers and Shoemaker's model of innovation diffusi -News diffusion: the J-Curve model.

Interview & Questionaire- questioning skills-interpreting the non-verb Before the Interview; going for the Interview; conducting the Intervie What makes a good interviewer? what makes a good Interviewee? Radio an TV Interviews

Methods of Data analysis: Cultural, economic, political, anthropologica sociological and psychological perspectives of data analysis.
Formative research to know the background to the data.
Audience profile for psycho-cultural picture and ethnographic data for the knowledge of broad social structure and organisation, occupational patterns, material culture and infra structural facilities.
Nees assessment - "felt needs", "observed needs" & "real needs"
Process research: assessment of response in terms of comprehension, credibility, utility-the social interaction, reaction that is noticed - content analysis of the messages.

Feedback-for gauging the effects-contextualization -for appropriate change.

Library Search: annotating a reading list - referencing conventions- supporting bibliography and references- making abstracts and summaries- using the material for a report, talk or project.

UNIT 3 : Language and Communication 15 periods

Concepts and Practice:
Language arts aims at developing skills and attitudes of effective communication (listening, speaking, reading, writing)- develop an appre- ciation and a knowledge of literature - to develop an appreciation and an understanding of language and how it is used in communication.

- Literature and language the foundation for the development of effec- tive communication
- Reception skills and expression skills.

Language and Mass communication
- evolving a new language like 'Hindustani' of Indian Cinema
- language of story-lowest common denominator
- language of symbols-semiotics-contextual language
- commerce boosting new languages

Language uses in different Mass media
- verbal and non-verbal languages-Print-Radio-Cinema
-TV-Ads-Telecommunication -Informatics

Language and Society
-Development of society through development of language
-Mass media's role in developing language, developing attitudes
-Language and Cultural interchanges in society.

Practicals 5:2:4(106) 9 periods
(Covering all the above three areas of this paper.)

-practical examples collected from media to illustrate the various definitions of communication.
-News reporting -prepare a copy of report according to norms
-Feedback-write a letter to the editor of a newspaper and get it published, bring it for evaluation.
-writing news-follow the 10 rules for writing the news and present your copy for evaluation.
- examples for direct attribution, indirect attribution, Fast breaking news-In depth reporting-interpretative reporting (news analysis)-feature stories(news features- colour stories-profiles-'Human Interest' -seasonal stories)
-Choose a relevant topic and report on it oin depth.
-Produce a pleasing and balanced newspaper front page
-newspaper layout
-make a 'Press Release' accoridng to the rules.
-Word processing and Desktop publishing techniques
-Exercises in interviewing
-Exercises in framing questionaires, conducting sample surveys, VOX POPULI spot surveys: Sample techniques
-Exercises in generating ideas:Brain storming-Synectics-Role playing
-Forcing techniques (Checklist,matrix) -Left, Right Brain exercises
-Six thinking hats-Brain patterns- Algorithms-flow charting
-Language for Mass communication -exercises in sports, writing, social and political spheres.
-Advertising-language-planning defensive and offensive campaigns-Art Director,Copy writer and Accounts supervisor in a media planning session from an idea to final copy-visuals vs copy.

BOOKS:

1. Wells, Alan,(ed),Mass media and Society,Palo Alto, Calif: Mayfield,1979
2. Becker, Samuel L., Discovering Mass Communication, London: Scott, Foresman, 1987.
3. David, C.R.W.(ed), Communication in Th.Education, Bangalore:BTESSC, 1986
4. Sleeman, Phillip J and Rockwell, D.M., (ed), Instruction Media and Technology, Stroudsburg, Pensylvania: Dowden,Hutchinson & Ross,1976
5. McLuhan Marshall, Understanding Media: The Extensions of man,New York: McGraw-Hill,1976
6. Brown, Michele, and Brandreth Gyles, How to Interview and be Interviewed, New Delhi: Sudha, 1988.
7. D'Abreo,Desmond A, The Mass Media and You, Bombay:BYB,1994
8. Roberge,Gaston,MEDIATION the action of the media in our Society, Delhi:Manohar, 1978.
9. Culture and Communication: An Introduction to mass media,Madras: YCS/YSM,1990
10. Amic: Asian Approaches to communication, Singapore: 1993
11. Mcquail, Denis,communication models for the study of mass communication, New York: Longman,1984.
12. Hart, Andrew, Understanding the Media, London, Routledge, 1991
13. Burton, Graeme, More than meets the eye- An Introduction to Media Studies, London:Edward Arnold, 1990.
14. Wright,Charles R., Mass Communication- A Sociological Perspective, New York: Random House, 1986

15. Fisher, Aubrey B, Perspectives on Human Communication,Macmillan

16. Schramm, Wilber (ed), Science of Human Communication.

17. Schramm, Wilber (ed), Process and effects of Mass communication.

18. Yadava, J.S., Communication in India, Muneo

19. Yadava J.S., Communication Research-some reflections, Muneo

20. Fiske J, Introduction to Communication Studies, London:Methac.

21. Kennedy, Alan, The Psychology of Reading, London: Methuen.

22. Perry, Nancy(ed), St.Martin's Guide to Writing, New York:, St.Martin's Press, 1988.

PAPER II

Maximum Marks	: 50	Time: 2 hrs (Theory)
Theory	: 25	3 hrs (Practs)
Practicals	: 15	
Internal Assesment	: 10	

VISUAL THINKING THEORY 3 periods/wk in periods practicals

1. Seeing before words - the gap between words and seeing -Reciprocal nature of vision-Seeing an act of choice-relating with things around us selectively
Images: a specific vision of image maker - amore precise and richer record of past than literature

2. Thinking Visually : Acquiring a visual sense
Education -observation-exercises

3. Visual composition: Balance -Golden mean-Balancing images-leverage-dramatic emphasis

4. Dominance: contrast- placement - lines: horizontal-vertical-diagonal -converging -diverging-framing-leading lines.

PERSPECTIVE - the eye of the beholder is the centre.

5. The CAMERA: the roving mechanical eye freeing man from his immobility
A new perspective of transsience and relativism
Man, no more the centre - reflected in
Impressionist and Cubist paintings.
Camera destroys the uniqueness of paintings
by making it available in more than one place
Pictures no more the prerogative of the elite
Picture travels to people and in the process
its uniqueness and meaning changes.

6. Rhythm : repetition of line, form, colour

7. Visual story telling - photocomics - story -board

8. Posters and Hoardings - principles-elements
First step in moving images - Mobiles

9. Images in the technological era: Electronic Billboards - in cinema, TV, video, satellite cable, on telephone network, video phone - on Computer INTERNET, CD-ROMS

10. Children and Images - influence -COMICs

11. Electronic Golden Calf - hidden persuaders

12. Pornography - a symbol of male domination in the image world.

13. Imagination and Images

14. Ways of seeing : Artists of various schools - In Advertisements old and new.

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Practicals:

1. Take one inch square rubbings of different textures and form a homogeneous graphic with any 16 squares.

2. Write your name in as many graphic styles you can possibly can- Explain their significance.

3. Cut 1 inch squares from B/W newspaper and form a graphic with 16 squares.

4. Use 16 squares of different colours to form your graphics.

5. Combine all the elements and form the graphics.

6. Creative Line - horizontal, vertical, diogonal, converging, diverging leading, framing lines, Line producing formal design - Line producing Informal design,
- Using the first function of line, 'line for itself' for composition- Line to divide or limit an area or space - Lines that delineate a thought or symbol- Lines define form by edge or contour-Lines to catch and direct the eye over a given course- Lines to produce a gray or tonal gradation and lines that create design or arrangement.

7. The "Fulcrum-lever" principle applied to composition.

8. Using formal subdivision for symmetrical composition.

9. Using Informal subdivision for creative composition.

10. Attention devices used in images - conflicts-radiating curves to focal point - pointing devices- speed-flames, fire-explosion-dive, fall flight-wing, sweep, spider web, spiral, radiating light, bulls eye motifs, impending disaster-attention is gained by contrast of line and shape.

11. Relationship of line to emotional response.

12. Balance in visual composition - The optical centre-The golden mean, Static Two-shot and the dynamic Two-Shot- The pull of the frame.

13. Achieve dominance by the use of contrast, placement, line.

14. examples of rhythm and movement

15. Visual story telling practices-pictorial essays -caption and no caption

16. Chalk talk
17. collages - where you are now and where you want to be

BOOKS:

1. Boulding, Kenneth E. The Image, Ann Arbor: University of Michigan Press, 1956.

2. Meyers, William, The Image Makers: Power and Persuasion on Madison Avenue, New York: Times Books, 1984.

3. Rader, Benjamin G. In Its Own Image: How Television Has Transformed Sports., New York: Free Press, 1984

4. Berger, John. Ways if Seeing, London: BBC, 1985.
5. Carpenter, Edmund, and Heyman, Ken. They Became What They Beheld. New York: Dutton, 1970.

6. Miri, M(ed), Art and Its Appreciation, Shillong: NEHU, 1989.

7. Bethell, A., Eyeopeners 1 & 2 , Cambridge: Cambridge University Press, 1981.

8. British Film Institute: Reading Pictures & Selling Pictures, London.

9. Life Library of Photography: The Art of Photography, New York, 1977

10. Audiovisual Serive: Chalk Talk parables, Anand: Gujarat Sahitya Prakash, 1986.

11. Singh, K.S. (ed), Visual Anthropology and India Calcutta: Anthropological Survey of India, 1992.

5:2:4(109)

12. Abraham, Abu(ed), Indian Cartoons, New Delhi:Penguin, 1988.

13. Rogers, Janet, Crazy Graffiti, London: Hamlyn, 1983

14. Lessel, William.M., Creating Graphics that Communicate, Chicago: Moody Press, 1987.

15. Letraset, Madrid, 1981.

16. Henning, Fritz, Concept and composition, Cincinnati:North Light, 1983.

17. Zettl, Herbert, Sight, Sound, Motion, Belmont, Calif: Wadsworth, 1973.

PAPER III

Maximum Marks : 50
Theory : 25
Practical : 15
Internal Assessment : 10

Time : 2 hrs (Theory)
3 hrs (Practs)

MEDIA SCENE IN INDIA

50 periods

1. Evaluation of Print media in India - Press: its role in the socio-economic political systems-under the English, in the freedom struggle-After Independence- Press and Business houses-Freedom of Press- The development of vernacular press- Self censorship - PTI- Press Council -DAVP and Control through Advertisement-Sarkaria Commission.
- The Boom in magazine and book publishing Industry- Niche Publishing
- Indian Paperbacks-Children's books - entry of multinationals
- Press laws in India: Constitution and press law

2. Introduction to Radio as mass medium - its characteristics-its development in India-All India Radio- Techniques of radio programme production in India- Broadcasting policy - The case for Autonomy - Community Radio in India.Commercial Radio (Vividh Bharati) FM Radio.

3. A short History of Indian Cinema - The 'Bollywood' and regional cinema.
The Films Division and Documentaries - NFDC _ Film Censorship - The Central Board of Film Certification- National Film Policy.
The Recorded music Industry - the new entrants-piracy

4. Indian Advertising Industry - development and big players- The multinationals and their direct entry- Advertising Council of India

5. Introduction of TV as mass medium - Characteristics - techniques of programme production-SITE programme- Kheda communications project-UGC countrywide class room-cinema the backbone of TV programming-Cable and Satellite TV - Video-CD_ROMS-Multimedia applications-the marriage between TV and Informatics.

6. The Public Relations Industry in India - coming of age.

7. Government Information and publicity systems - basic principles of Govt.publicity-guidelines for operation.

Practicals

9 periods

Covering press, radio, cinema, TV, Govt.publicity systems-case studies

BOOKS

1. Report of 2nd press commission of India(Govt.of India)
2. Rao, Chalapati, The Press.
3. Lent, John, The Asian Newspaper: Reluctant Revolution, Iowa State Press.

4. Evans E., Radio - A Guide to broadcasting technique.

5. Abbot, Waldo, and Rider R, Handbook of Broadcasting,McGraw Hill.
6. Bretz, Rudy, Techniques to Television Production, McGraw Hill.

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7. Masani, Mehra, Broadcasting and the People, NBT.

8. Kumar, Keval J, Mass Communication In India, Bombay:Jaico, 1994.

9. Rangoonwalla, Firoze, A pictorial History of Indian Cinema, London: Hamlyn, 1979.

10. Valicha, Kishore.Dr., The Moving Image- A Study of Indian Cinema, Bombay: Orient Longman, 1988.

11. Roberge, Gaston, Chitra bani, Calcutta: Chitra bani, 1974.

12. Mukherji, Bandana.Smt., Media Invades India's values, Calcutta: 1987.

13. Information and Broadcasting Ministry's Annual Reports.

14. Mass Media In India (research and Reference division).

15. Sontakki, C.N., Advertising, New Delhi: Kalyani, 1989.

16. Malovany, Sheila, and Chevallier, Advertising, Eastbourne:Cassell, 1980.

UNIT 2 : Media Appreciation 25 periods

1. General Introduction - Why appreciate? Each medium has a unique aesthetic form that can be learned and enjoyed- criteria:subjective/ objective, Film, TV, Art, Advertising, Graphics, etc...

2. How to read a film - approaches

3. Methods, Anti-methods, mis nderstandings

4. Film Theory

5. Advertising- reduction and international messages-analysis.

6. Fiction- documentary, relation, scripting, deconstruction/reception.

7. Popular/populism TV culture-high theory-low culture, Genres-popular videos.

8. Competitive and narrative cross media studies-the mediasphere.

9. Problems of writing on or about media- the media mess.

10. Personal/social issues/reception theories.

This unit needs approximately 60 hours of viewing and demonstrating sessions, besides the lectures hours.

BOOKS:

1. Philippine Association for Media Education, Media Literacy Manual.

2. Canadian Ministry of Education, Media Literacy, Ontario, 1989

3. Canadian Ministry of Education, Meet the Media, Ontario, 1990

4. The Media Education Journal, (Issue 15), Media Across the Century, Glasgow:Winter 1993.

5. Lusted, David, The Media Studies Book, London: Routledge, 1991.

6. Masterman, Len, Teaching about Television, London: Macmillan, 1991.

7. Logan, Ben(ed), Television Awareness Training, Nashville:MARC, 1979.

8. Media & Values (Number 57), Impact of Images-Life and culture in the media age, Los Angeles, Calif: Winter:1992.

9. East Asian pastoral Institute: Film Theory & Appreciation, Manila.

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PAPER IV

Maximum Marks	: 50	Time: 2 hrs(Theory)
Theory	: 25	4 hrs(Practs)
Practical	: 15	
Internal Assessment	: 10	

MEDIA SCRIPWRITING -VIDEO

45 periods (Theory)
45 periods (Practs)

1. Introduction, Role of Writer, elaborative efforts.
2. Production process, requirements, stages.
3. Elements of structure - Beginning, middle and end.
4. Identifying significant detail - concepts.
5. Defining parameters of production - audience-budgets.
6. Subject Research
7. Writing an audio-visual Script
8. Writing a shooting Script
9. Scripting the unscriptable
10. Introduction to research technique
11. Sources of information and materials
12. Organising and presenting the material
13. Points of view, credibility, accuracy
14. Intravening as a resource in writing
15. Transition devices available to the writer
16. Use of sound
17. Visual grammar
18. Narrative styles
19. Writer and the Law
20. Writer and the Budget
21. Writing narration
22. Writing for current affairs

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Practicals

1. Create a Copy Platform using your college's prospectus. You could take a poll to determine why the students attend your college.

2. Write a Copy following the cohesion formula, Schwab's Caples' Rules, the 2-1-3 system approach, the ERISCO index etc.

3. Choose a TV episode and write down the main IDEA, a SYNOPSIS of basic story line, the OUTLINE of the story, its final TREATMENT in dialogue form.

4. Write a short indident, reflection on the event by those who witnessed it, including you, give the character sketches of those involved and finally the place it happened.

5. Connecting your script to the bssic visual grammar of video.

6. Developing the 'HOOK' to hang your narration.

7. Develop your BEGINNING, BODY and END of story. Involving the elements of Theme/Problem, hero/Heroine, Villain/evil situation, Force that empowers the Hero/ Heroine, allies that help, the trial of strength, The Climax and the resolution.

8. Write a physical imagery Radio spot script.

9. Write a spot of 60 seconds duration and edit down to 30 seconds spot.

10. Write a 30- second spot with special attention to functional imagery.

11. Rewrite the previous spot emphasizing association imagery now.

12. Organise a brainstorming session to plan a campaign for college week activities. Collate all ideas.

13. Select a product and organise a focus group that prepares a slogan and determines its effectiveness.

14. Demonstrate the proper use of sound effects, music and microphone perspective techniques.

Contd..../-

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15. Write a 30- second spot with multiple voices/ SFX/music, using testimonial format.

16. Write a 60- second multiple voice/SFX/ music spot, using the problem solution format.

17. Write scenarios to illustrate the following formats;
Fantasy format, personal selling format, mini drama format, demonstration format.

18. Select a current television commercial. Record the audio and transcribe it. Write a parody of the commercial using the style and key phrases that make it distanctive.

19. Using CONVENTIONS OF VISUAL LITERACY prepare a 30-second TV spot. You can use spoken copy only for a minimum of 10 seconds.

21. Make a survey on the handicraft industry and write a scenario based on it.

22. Use an existing video tape produce your own promotional spot.

23. Record only the audio part of a TV commercial and make your own visuals.

24. Incorporate the various audio recordings in your script and make a scenario.

25. Prepare two scenarios for 30-second TV spot. Use story line or problem solving for one, spokesperson or personality for the second. Feature an event in one and retailer image on the other.

26. Prepare Three story boards; two 30 - second spots and one 15-second "lift" based on one the 30s.

27. Select one TV spot and turn it into a Radio spot adding appropriate aural cues.

Contd..../-

5:2:4(114)

BOOKS:

1. Harding, Joh, the craft of TV Copywriting, London: Allison, Busby, 1988.

2. McGuire, Jerry, How to write, direct & produce effective business films & documentaries, Blue ridge Summit, PA.: Tab, 1978.

3. Mustace, Grant, Writing for Corporative Video, London: Focal Press, 1990.

4. Stewart, Ian, The Business Writing Workbook - A Guide to Defensive writing skills, London: Kogan page, 1987.

5. Orlik, Peter B., Broadcast Copywriting, Boston: Allyn & Bacon, 1978.

6. Goldman, William, Adventure in the Screen Trade, New York: Warner, 1983.

7. Peck, William A., Anatomy of local Radio - TV Copy, TAB, 1976.

8. Hagerman, William L., Broadcast- Advertising Copywriting, London: Focal, 1990.

9. Mehring, Margaret, The Screenplay - a blend of film form and content, Boston: Focal Press, 1990.

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Paper V

Maximum Marks	100	Time:	3 hrs (Theory)
Theory	50		6 hrs (practs)
Practical	30		
Internal Assessment	20		

SOUND FOR THE MEDIA — 45 periods (Theory) 45 periods (Practs)

1. Characteristics of sound wave and its propagation

2. Acoustics, Echo, R.T. Decibels etc.

3. Quality of sound, Frequency reference S/N ratio distortions.

4. Mechanics of Human speech and hearing physiology and psychology, thresholds of hearing and feeling etc.

5. Microphones - types - Special Microphones (wireless, lapel, reflector, Shot gun) accessories.

6. Directional responses and polar diagram.

7. Factors governing the selection of mikes.

8. Types of cables and connectors and their uses.

9. Magnetic recording principles.

10. Tape recorders and play back machines.

11. Audio Tapes.

12. Sound Safety, erasing, Dole sheet, storage.

13. Post production - editing, dubbing, laying tracks.

14. Mixing Sound.

15. Frequency response controls.

16. Audio sweetening.

17. Monitoring.

18. Organisation of sound effects and music library.

19. Difference in the recording, editing and mixing for different media.

Contd.../-

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20. Audio Visual contrast and harmony, creative application.

21. Sound recordist role in a Production crew.

Practicals.

1. Hook-up for checking frequency response.

2. Use a square-wave generator to check amplifier.

3. Make a simple signal tracer.

4. Add stereo extension speakers connected in series, parallel and series-parallel and control the volume at the extension speaker.

5. Make the following types of crossover network:
   a. High-pass crossover network.
   b. constant- Impedance crossover network.
   c. Filter-type crossover network.

6. Acoustic calculations.

7. Checking microphones for frequency responses

8. Impedance matching - phase matching and correction

9. Record a set of natural sounds and incorporate them in a Radio spot.

10. Manufacturing Sound effects in the studio.

11. Three Mike techniques.

12. Sound in the Television Studio - booms and lighting - sound balance.

13. Exercises in monitoring Sound.

14. Mixing and dubbing practical - recording controls - multi tracking Track overlaying - punch in and out - Noise reduction systems.

15. Physical editing of audio tape - manipulation of tape - tape loops.

16. Improvise a audio studio

17. Studio procedure - practicals - scripts, cue sheets, scoring sheet, lead sheet.

Contd.../-

5:2:4(117)

BOOKS:

1. Nisbett, Alec, The technique of the Sound Studio; London: Focal, 1986.

2. Runstein, Robert. E., Modern Recording Techniques, Indianapolis : SAMS, 1984.

3. Tombs, David, Sound Recording - from microphone to master tape, London : David & Charles, 1980.

4. Everest, Alton. F, Handbook of Multi channel Recording, Blue Ridge Summit, PA.: TAB, 1975.

5. Everest, Alton. F, Acoustic Technique for home and studio, Blue Ridge Summit, PA.: TAB, 1973.

6. Gardner, John, Master Creative Tape Recording, London: Newnes, 1977.

7. Sinclair, I.R., Master Stereo Cassette Recording, London: Newnes, 1976.

8. Towers, T.D, Master Electronics in Music, London: Mewmes. 1976.

9. Nisbett, Alec, The Use of Microphones, London: Focal, 1986.

10. Clifford, Martin, Microphones - How they work & how to use them, Blue Ridge Summit, PA. : TAB, 1977.

11. Kent, Mike, Add Sound to your Movies, London: Macmillan, 1979.

12. Collins, W.H, The amateur Filmmaker's handbook of Sound Sync & Scoring, Blue Ridge Summit, PA.: TAB, 1974.

13. Sands, Leo. G, and Shunaman, Fred, 101 Questions and Answers about Hi-Fi & Stereo, Bombay: Taraporewala, 1972.

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Paper VI

Maximum Marks	100	Time : 3 hrs (Theory)
Theory	50	4 hrs (Practs)
Practicals	30	
Internal Assessment	20	

VIDEO FOR COMMUNICATION — 45 periods (theory) 135 periods (Practs)

1. Video Camera Basic design - Tube, CCD, MOSFET, HAD designs.

2. Video Tape - Head, scan, tape format - accessories - electronic editing of tape - bandwidth, distortion, noise, time base correction (TBC), video track - VTR/VCR - Connections - personnel, area - Production with simple recorders - spphisticated production methods.

3. Basic Shots - terminology - composition

4. Lighting and exposure - Three point lighting - lighting equipments.

5. Electronic editing off line & On line. - Editing methods - Editing hints - logging and Dubbing - Cue Sheets - Assembly script - rough cut - Fine cut - Assemble edit - Insert Edit - Tape handling sequence .

Practicals

1. Basic Composition and different shots

2. Different camera movements

3. Angles of shots

4. Key, Fill, Back light exercises

5. Graphics practicals

6. Special effects on Camera - in post production

7. Tape handling sequence exercises

8. Edit - On and Off line exercises.

(Book list at the end of Paper VIII)

Contd.../-

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Paper VII

Maximum Marks	100	Time : 3 hrs (Theory)
Theory	30	6hrs (Practs)
Practical	50	
Internal Assessment	20	

VIDEO STUDIO PRODUCTION — 45 periods (Theory) 135 periods (Practs)

1. The Video studio - basic and expanded Production - the control room set up - The production team personnel - their jobs.

2. Studio camera set ups - CCUs - Multiple camera shoots - cabling - talkback.

3. Sound for Video studio

4. Lighting in the studio - basic illumination - creative lighting

5. Studio production - script - shooting script - camera script - floor plans - Floor manager's signals

6. Studio procedure

7. On line editing - Vision mixing - SFX

Practicals

Practicals in all the above mentioned in - studio procedures.
4 periods (9 hrs.) of practicals every week for at least 15 weeks.

(Book list at the end of Paper VIII)

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Paper VIII

Maximum Marks 250 Time : 3 hrs (Theory

Theory 50
Project 160
Internal Assessment 40

VIDEO ELECTRONIC FILM PRODUCTION 30 periods

1. The ENG (Electronic News Gathering) - equipment and operation - production.

2. EFP (Electronic-Film Production) - equipment, and operation - production .

3. EFP: Proposal - synopsis, outline, treatment, Script - shooting script - Camera Script.

4. Research, Reconnaissance - location survey - talent - casting - equipment hiring - scenery - costumes - makeup - props - physical arrangements - permission - release - copyright procedures.

5. Studio Personnel and location crew.

6. Budgeting - Production meeting.

7. Shooting

8. Editing (rough cut assemble)

9. Special effects

10. Collection/recording of sound effects and music

11. Recording narration - dubbing

12. Laying commentary track

13. Laying of music and effects track

14. Final mixing

15. The Show and evaluation.

Contd.../-

BOOKS: 5:2:4(121)

1. Legy Wayne, portapak Production techniques, Singappore, AMIC 1986

2. Millerson, Gerald, Video Production Handbook, London: Focal, 1986.

3. Millerson, Gerald, The Technique of Television Production, London: Focal, 1977 .

4. Brian, Winston, and Keydal, Julia, Working with video - A comprehensive guide to the world of video production.

5. Millerson, Gerald, Basic TV staging, London: Focal.

6. Wurtzel, Alan, Television Production New York: McGraw-Hill, 1985.

7. Millerson, Gerald, Video Camera Techniques, London: Focal, 1988.

8. Alkin, Glyn, TV Sound Operations

9. Media Manual Series: Sound Techniques for Video and TV, London: Focal, 1978

10. Claver, Mary Peter, and Jyosita, Mary, First Steps to TV-Video Production, Patna: Bharati Bhawan, 1992.

11. Birmingham, Alan, and Talbot Smith, Michael, and others, The small Television Studio, London: Focal, 1985.

12. Wilkie, Bernard, Creating Special effects for TV and Films, London: Focal, 1985

13. Rowlands, Avril, Script Continuity and the Production secretary London: focal, 1987.

14. Millerson, Gerald, TV Lighting Methods, London: Focal, 1987.

15. Brooks, Keith and others Book of Creative Video, London: Newnes, 1985.

16. Porter, Martin, The complete guide to making Home Video Movies, New York: Pocket books, 1987.

17. Robinson. J.F, and Beards. P.H. , Using Video Tape London: Focal, 1981.

Contd.../-

5:2:4(122)

Paper IX

Maximum Marks	50	Time : 3 hrs
Theory	35	
Internal Assessment	15	

ENTREPRENEURSHIP AND MARKETING 15 periods

1. Interfacing with media Institutions :- portfolio management

2. Selling the idea - advertising _ Public relations - Campaigns - Marketing imperatives.

3. Client servicing - Media planning - mock ups - market analysis

4. Dealing with media laws regarding right tc privacy, obscenity - copyright - Government regulations regarding broadcast, censorship, advertising conduct- Consumer's court.

BOOKS:

1. Kumar, Keval. J, Mass Communication in India, Bombay: Jaico, 1994.

2. Becker, Samuel L, Discovering Mass Communication, London: , Scot, Foresman & Co, 1987.