

SHIVAJI UNIVERSITY, KOLHAPUR.



**“A” Re-accredited By NAAC
(2014) with CGPA-3.16**

**Revised Syllabus For
Bachelor of Sugar Technology
(Part I)**

(Subject to the modifications to be made from time to time)

Syllabus to be implemented from June 2015 onwards.

A] **Ordinance and Regulations:-**
(as applicable to degree/programme)

B] **Shivaji University, Kolhapur**
Revised Syllabus For
Bachelor of Sugar Technology

1. TITLE : Subject

Optional/Compulsory/Additional/IDS under the **Faculty of Science**

2. **YEAR OF IMPLEMENTATION:-**Revised Syllabus will be implemented from June 2015 onwards.

3. PREAMBLE:-

The Board of Studies should briefly mention foundation, core and applied components of the course/paper. The student should get into the prime objectives and expected level of study with required outcome in terms of basic and advance knowledge at examination level.

4. GENERAL OBJECTIVES OF THE COURSE/ PAPER/ :
(as applicable to the Degree /Subject- Paper concerned)

While introducing this course university intends to give an emphasis on

- i) Training the graduates for advanced methods of cane-sugar production processes related to lab-chemist, supervisor, pan-man, boiler attendants, etc.
- ii) Training the personnel for production of allied sugar based products like alcohol, acetone, acetic acid, oxalic acid, etc.
- iii) Training the personnel for co-generation (power generation) from biomass.
- iv) Training the personnel to start small scale sugar based industries.
- v) Training the personnel for water management and pollution control.

5. DURATION

- **The course shall be a full time course 3 years**
- **The duration of course shall be of 3 years /6 Semesters.**

6. PATTERN:-

7. FEE STRUCTURE:- (as per approved by SSS)

8. IMPLEMENTATION OF FEE STRUCTURE:-

In case of revision of fee structure, this revision will be implemented in phase wise manner as mentioned below:-

For Part I- From academic year 2015 onwards.

9. ELIGIBILITY FOR ADMISSION :-

As per eligibility criteria prescribed for each course and the merit list in the qualifying examination.

10. MEDIUM OF INSTRUCTION :

The medium of instruction shall be in English.

11.STRUCTURE OF COURSE-

(Note – The structure & title of papers of the degree as a whole should be submitted at the time of submission/revision of first year syllabus.

**B.Sc.Sugartech First Year (No. of papers – 9)
Semester 1(Theory Paper)**

Sr. No.	Subject	Marks
1	English	50
2	Applied Chemistry Paper – I (Organic & Sugar Chemistry)	50
3	Applied Chemistry Paper – II (Physical and Inorganic Chemistry)	50
4	Applied Physics Paper – I (Properties of matter and Thermodynamics)	50
5	Applied Physics Paper – II (Instrumentation – I)	50
6	Applied Mathematics Paper – I	50
7	Applied Statistics Paper – II	50
8	Sugar Cane Agriculture Paper – I	50
9	Sugar Manufacturing Paper – II (Juice Extraction and Clarification)	50
	Total	450

**B.Sc.Sugartech First Year (No. of papers – 9)
Semester 2(Theory Paper)**

Sr. No.	Subject	Marks
1	English Paper-II (Compulsory) (English For Communication)	50
2	Applied Chemistry Paper – III (Organic & Bio Chemistry)	50
3	Applied Chemistry Paper – IV (Physical and Analytical Chemistry)	50
4	Applied Physics Paper - III (Optics and Crystallography)	50
5	Applied Physics Paper - IV (Instrumentation – II)	50
6	Applied Mathematics Paper – III	50
7	Applied Statistics Paper – IV	50
8	Sugar Cane Agriculture Paper – III	50
9	Sugar Manufacturing Paper – IV (Evaporation)	50
	Total	450

12. Scheme of teaching and Examination

The scheme of teaching and examination should be given as applicable to the course / paper concerned.

Semester 1

Sr. No.	Subject	Teaching scheme (Per Week)			Examination Scheme		
		L	T	P	Theor y	Term work	Total
1	English	04	0 0	00	50	-	50
2	Applied Chemistry Paper – I (Organic & Sugar Chemistry)	03	0 0	01 (200 Min)	50	-	50
3	Applied Chemistry Paper – II (Physical and Inorganic Chemistry)	02	0 0		50	-	50
4	Applied Physics Paper – I (Properties of matter and	03	0 0	01 (200	50	-	50

	Thermodynamics			Min)			
5	Applied Physics Paper – II (Instrumentation – I)	02	0 0		50	-	50
6	Applied Mathematics Paper – I	03	0 0	01 (200 Min)	50	-	50
7	Applied Statistics Paper – II	02			50	-	50
8	Sugar Cane Agriculture Paper – I	03		01 (200 Min)	50	-	50
9	Sugar Manufacturing Paper – II (Juice Extraction and Clarification)	02			50	-	50
	Total				450		450

Semester 2

Sr. No.	Subject	Teaching scheme			Examination Scheme		
		L	T	P	Theor y	Term work	Total
1	English Paper-II (Compulsory) (English For Communication)	04	00	00	50		50
2	Applied Chemistry Paper – III (Organic & Bio Chemistry)	03	00	01 (200 Min)	50	50	100
3	Applied Chemistry Paper – IV (Physical and Analytical Chemistry)	02	00	00	50	50	100
4	Applied Physics Paper - III (Optics and Crystallography)	03	00	01 (200 Min)	50	50	100
5	Applied Physics Paper - IV (Instrumentation – II)	02	00	00	50	50	100
6	Applied Mathematics Paper – III	03	00	01 (200 Min)	50	50	100
7	Applied Statistics Paper – IV	02	00	00	50	50	100
8	Sugar Cane Agriculture Paper – III	03	00	01 (200 Min)	50	50	100
9	Sugar Manufacturing Paper – IV (Evaporation)	02	00	00	50	50	100
	Total	24			450	400	850

12. SCHEME OF TEACHING AND EXAMINATION:-

[The scheme of teaching and examination should be given as applicable to the course/paper concerned.]

13. SCHEME OF EXAMINATION :-

- The examination shall be conducted at the end of each academic semester.
- The Theory paper shall carry **50** marks of Each semester.
- The evaluation of the performance of the students in theory papers shall be on the basis of Semester Examination of **100** marks.
- Question Paper will be set in the view of the /in accordance with the entire Syllabus and preferably covering each unit of syllabus.

Practical evaluation scheme is as follows

50% marks internal i.e. continuous evaluation

50% marks external and semester Practical examination where external examiners must evaluate the performance being an applied course.

14. STANDARD OF PASSING:-

As Prescribed under rules & regulation for each degree/programme.

15. NATURE OF QUESTION PAPER AND SCHEME OF MARKING :-

(Unit wise weightage of marks should also be mentioned) 2 Hrs. 50 marks.

Q.1) Choose correct alternative from the following. 10 Marks

Q.2) Attempt any Four from the following. (Any 4 out of 6) 20 Marks

Q.3) Solve any Two of the following (Any 2 out of 4) 20 Marks

Evaluation of the theory papers by external examiners in CAP

Internal :

1. Surprise test and assignment / semester/ tutorial

Practicals

a) Evaluation done by external / internal examiners

b) Evaluation projects by external examiners

16. EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS- (FOR REVISED SYLLABUS)

B.Sc (Sugartechnology) Part-I Sem-I

Sr.No.	Title of Old Paper	Title of New Paper
1.	English Paper-I (Compulsory) (English For Communication)	English Paper-I (Compulsory) (English For Communication)
2.	Applied Chemistry Paper – I (Organic & Sugar Chemistry)	Applied Chemistry Paper – I (Organic & Sugar Chemistry)
3.	Applied Chemistry Paper – II (Physical and Inorganic Chemistry)	Applied Chemistry Paper – II (Physical and Inorganic Chemistry)
4.	Applied Physics Paper – I (Properties of matter and Thermodynamics)	Applied Physics Paper - I (Properties of matter and Thermodynamics)
5.	Applied Physics Paper – II (Instrumentation – I)	Applied Physics Paper - II (Instrumentation – I)

6.	Applied Mathematics Paper – I	Applied Mathematics Paper – I
7	Applied Statistics Paper – II	Applied Statistics Paper – II
8	Sugar Cane Agriculture Paper – I	Sugar Cane Agriculture Paper – I
9	Sugar Manufacturing Paper – II (Juice Extraction and Clarification)	Sugar Manufacturing Paper – II (Juice Extraction and Clarification)

B.Sc (Sugartechnology) Part-I Sem-II

Sr.No.	Title of Old Paper	Title of New Paper
1.	English Paper-II (Compulsory) (English For Communication)	English Paper-I (Compulsory) (English For Communication)
2.	Applied Chemistry Paper – III (Organic & Bio Chemistry)	Applied Chemistry Paper – III (Organic & Bio Chemistry)
3.	Applied Chemistry Paper – IV (Physical and Analytical Chemistry)	Applied Chemistry Paper – II (Physical and Analytical Chemistry)
4.	Applied Physics Paper - III (Optics and Crystallography)	Applied Physics Paper - III (Optics and Crystallography)
5.	Applied Physics Paper - IV (Instrumentation – II)	Applied Physics Paper – IV (Instrumentation – II)
6.	Applied Mathematics Paper – III	Applied Mathematics Paper – III
7	Applied Statistics Paper – IV	Applied Statistics Paper – IV
8	Sugar Cane Agriculture Paper – III	Sugar Cane Agriculture Paper – III
9	Sugar Manufacturing Paper – IV (Evaporation)	Sugar Manufacturing Paper – IV (Evaporation)

Reccomended following books and journals

Instruments to be purchased

Suggations

(NOTE :

i) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

ii) General/Specific instructions for Laboratory safety should be given wherever necessary)

C] OTHER FEATURES :

1. **INTAKE CAPACITY / NUMBER OF STUDENTS:-** 50 students
(Wherever applicable)

3. The Board of studies should clearly mention the required Books, Journals and specific Equipments necessary for the Course.

(A) LIBRARY :

Reference and Text Books, Journals and Periodicals, Reference Books for Advanced Books for Advanced studies.

(B) SPECIFIC EQUIPMENTS : Necessary to run the Course.

(T.V., V.C.R. V.C.P., L.C.D., Overhead Projector) (Computers and necessary softwares and operating systems etc.)

(C) LABORATORY SAFETY EQUIPMENTS :

As Per Given At the End Of Syllabus.

Syllabus Frame work - General Guidelines :-

A) i) The Board of Studies and the faculty should Pass the resolutions consistent with the powers and duties mentioned in Maharashtra Universities Act-1994 and statutes made there under.

The Board of Studies and faculties should put their efforts in bringing high standards in curriculum framework and updating the syllabi to cater to future needs of Higher Education. This should cover demanding needs of industry and Commerce, upcoming trends and developments, research strategies, interdisciplinary areas of teaching and research. The education system and the curriculum developments should be linked with career aspirations of our students.

The success of the university is judged by the quality of graduates it produces. Therefore, university should maintain the highest standard in its teaching and examination by which the student can attain and develop their capacity.

The University Grants Commission has developed model curriculum to provide a broad common frame work for exchange for mobility and free dialogue across the entire Indian academic community with a view to bring upon continuous improvement. Further the UGC looks towards advancement of knowledge industries by adding career orientation approach in course contents and syllabus framework. Likewise it focuses upon new techniques of education through cafeteria approach, credit system, internal assessment and term work, semester system, bridge courses and add on courses for soft skill development of students from placement point of view. Further it focuses upon need based research by adding the research component at under graduate and post graduate level through project work, industry-academia interaction, industrial tours and training to students etc.

Distance Education is at another mode which will help our university to increase the access of higher education to the marginalized and weaker sections of rural society and in the process will help to make university education more socially inclusive.

ii) The Chairman, Board of studies and the Deans of the faculty should check the syllabus submitted by their concerned Board as per the check list mentioned below :

- 1) Standard syllabus format should be followed for every course/paper. It should be noted that few components (given in standard format) like duration, pattern, intake capacity, fee structure, eligibility for admission etc. are applicable to syllabus framework of part –I only.
- 2) The title of papers should be unique. Repetition in titles should be avoided.
- 3) General objectives of the degree/course with specific objectives of each paper should be mentioned in the syllabi.
- 4) The structure & title of papers of the degree as a whole should be submitted at the time of submission/revision of first year syllabus.
- 5) General Instructions for laboratory safety should be added as a part of syllabi, wherever necessary
- 6) While framing the syllabus, the detailed elaboration of foundation, core and applied components alongwith advanced areas of study is essential.

It should be mentioned in detail the expected level of study of each unit or the syllabus from examination and assessment point of view.

- 7) While giving the nature of Question Paper it should be strictly mentioned that the Question paper will be set in the view of the/in accordance with the entire syllabus.
- 8) The syllabus of every Paper/Subject should be framed in accordance with UGC curriculum guidelines.
- 9) The unit wise syllabus should be framed with general pattern 4-5 units per paper covering 38 lectures workload for each paper.
- 10) The board of studies and the faculty should prepare standard document of operational manual for Laboratory safety. List of standard Equipments required for particular course/degree programmes should also be mentioned in the said document. This will enable to streamline the university education system towards quality enhancement.
- 11) The nature of question paper should be in accordance with the common policy approved by Academic Council dated 23 -11-06 wide

Item No. 9. In view of the same each question should not more than 8 marks.

- 12) The nature of question paper should be common for various courses/subjects/papers within the same faculty.
- 13) There should be a broad homogeneous frame of policy amongst the board of studies and faculty regarding nature of question paper and level of questions covering Informative, Application, subject aptitude and depth of understanding of students. The process of evaluation and assessment should give ample scope for additional marks to those students, whose answer are based on advanced level of study as evidenced for additional reading of the student.

B) GENERAL SAFETY RULES FOR LABORATORY WORK

1) List of equipments needed for Laboratory Safety:-

1. Fire extinguisher
2. First Aid Kit
3. Good earthing and insulated wirings for electrical supply.
4. Emergency exit
5. Apron and goggles wherever necessary
6. Fuming Chambers
7. Masks flows and shoes while handling hazardous chemicals & gases (Good valves, manometers and regulators for gas supply)
8. Operational manuals for instruments (handling to be made as suggested.)
9. Rules of animals and blanks ethics.
10. Leakage of gases to be avoided.
11. Cylinders or flow pipes to handle Acids.
12. No weighings for NaOH and hygroscopic substances.
13. Stabilized supply in the laboratory.

2) There Is No Substitute For Safety

1. Any injury no matter how small, it must be reported to teacher immediately.
2. a) In case any chemical enters your eyes go immediately to eye-wash facility and flush your eyes and face with large amount of water.

- b) For acid or phenol spill, do not use water instead put some bicarbonate.
- 3. In case of fire, immediately switch off all gas connections in the laboratory and pour sand on the source of fire or cover it with asbestos or cement sheet.
- 4. While leaving laboratory, make sure that gas, water taps and electricity are switched off.
- 5. Remove your lab coat. Wash and clean your hands before leaving laboratory.
- 6. Make your workplace clean before leaving the laboratory.
- 7. Keep your hands away from your face, while working in laboratory.
- 8. Each laboratory must have a first aid box.
- 9. Know what to do in case of emergency - e.g.
 - (a) Know the place of fire extinguisher and first aid box.
- 10. Don't use cell phones in the laboratory.
 - (a) Remember important phone numbers

3) DO's

- 1. Always wear lab coat, shoes in the laboratory. Every student must have their weight box, a napkin etc.
- 2. Maintain separate record book for each subject.
- 3. Keep your belongings at the place allotted for the same.
- 4. Maintain silence, order, cleanliness and discipline in the laboratory.
- 5. Work at the place allotted to you or specially used for certain operations.
- 6. Keep the working table clean.
- 7. Handle the laboratory equipments, glassware and chemical with great care.
- 8. Use only required quantities of material and apparatus of essential size.
- 9. Perform the test in their proper order.
- 10. Know the location of eye wash fountain and water shower.

11. Minimize your exposure to organic solvents.
 12. The Metal like sodium should be kept under kerosene or liquid paraffin layer in a vessel with a cork stopper.
 13. Sodium metal should be cut on dry filter paper. The cut off pieces of sodium should be immediately collected in a vessel containing kerosene or liquid paraffin.
 14. Always pour acid into water when diluting and stir slightly.
 15. All operations involving poisonous flammable gases and vapors' should be carried out in the flame chamber (with exhaust facility)
 16. Ladies should avoid wearing saree. If it is there, apron is essential.
- 4) DON'T
1. Don't work alone in the laboratory
 2. Don't leave the glass wares unwashed.
 3. Don't take apparatus, chemicals out of lab.
 4. Don't leave any substance in a vessel or bottle without label.
 5. Don't weigh the reagent directly on the balance pan.
 6. Don't. throw the cut off pieces of sodium metal in sink or water. Transfer it immediately in it's container.
 7. Don't take sodium metal with hands. Use forceps.
 8. Don't panic and run in case of fire. Use the fire extinguishers or sand buckets.
 9. Don't breathe the vapours of organic solvents.
 10. Don't. pour any unused reagent back in its stock bottle.
 11. Don't eat or drink any food in laboratory.
 12. Don't use inflammable solvents like benzene, ether, chloroform, acetone and alcohol around flame.
 13. Don't distill to dryness.
 14. Don't exchange stoppers of flasks and bottles containing different reagents.
 15. Don't leave reagent bottle lying on the table.
 16. Don't disturb the order of reagent bottles in which they are placed.
 17. Don't bring reagent on your working table from the general shelf.

18. Don't throw burning matchstick into dustbin.
19. Don't leave the laboratory without permission.

5) LAB SAFETY PRECAUTIONS / MEASURES IN CHEMISTRY LABORATORY

Part I : Personal Precautions

1. All personnel must wear safety Goggles at all times
2. Must wear the Lab Aprons/Lab Jacket and proper shoes.
3. Except in emergency, over-hurried activities is forbidden.
4. Fume cupboard must be used whenever necessary.
5. Eating, Drinking and Smoking in the laboratories strictly forbidden.

Part II : Use of Safety and Emergency Equipments

1. First aid kits
2. Sand bucket
3. Fire exextinguishers (dry chemical and carbon dioxide extinguishers)
4. Chemical Storage cabinet with proper ventilation
5. Material Safety Date sheets.
6. Management of Local exhaust systems and Fume hoods.
7. Sign in register if using instruments.

B.Sc. Sugar Technology Part –I

Semester – I

Subject : English – I (Compulsory)

English for Communication

Section I :- Communication Skills

Unit 1 : How to Express Your Views and Opinions.

Unit 2 : Talking About Personal Experiences.

Unit 3 : Preparing a C.V. and Writing a Letter of Application

Section II : Reading Comprehension Skill

Unit 4 : Forgetting -Robert Lynd

Unit 5 : Wife's Holiday -R.K. Narayan

Unit 6 : Man in the Future -Bill Williams

Unit 7 : Prafulla Chandra Ray

Pattern of Question Paper Sem- I			
Q.1)	A)	Complete the following by choosing the correct option (Set to be on Reading skill Units)	05
	B)	Textual vocabulary Items Synonym – 1 Antonym – 1 Pairing the words (With meaning) – 1 Change the Grammar class-1 Word-formation-Affixation-1	05
Q.2	A)	Answer any Three of the following in 2 to 3 sentences (Out of 4)	06

		1. 2. 3. 4.	
	B)	Write short notes on any ONE of the following (Out of 2)	04
Q.3	A)	Express your agreement or disagreement on the following topics.	05
		(Unit no 1) B) Express your opinions or views on the following topic in 5 to 6 sentences.	05
Q.4		(Unit no 2)A) Narration OR	
		Piece of conversation regarding personal problems / Experiences	05
		(Unit No.3) B) Write an application letter OR C.V. <i>Note:- A question should be set either on writing an application letter or C.V. only</i>	05

Semester – II

Subject : English –II (Compulsory)

English for Communication

Section I :- Communication Skills

Unit 1 : Telephonic and E-mail communication.

Unit 2 : Making Notes.

Unit 3 : Information Transfer.

Section II :- Reading Comprehension Skill

Unit 4 : Public Attitude towards Science -Stephen Hawking

Unit 5 : Smart Village : Hansdehar -Archana Binbusar

Unit 6 : Entertainment -Nissim Ezekiel

Unit 7 : Parachute -Lenrie Peters

: Argument with God -Y. S. Chemba

Unit 8

		Pattern of Question Paper Sem- II	
Q.1)	A)	Complete the following by choosing the correct option	05

		(Set to be on Reading skill Units)	
	B)	Textual vocabulary Items Synonym – 1 Antonym – 1 Pairing the words (With meaning) – 1 Change the Grammar class-1 Word-formation-Affixation-1	05
Q.2	A)	Answer any Three of the following in 2 to 3 sentences (Out of 4) 1. 2. 3. 4.	06
	B)	Write short notes on any ONE of the following (Out of 2)	04
Q.3	A)	(Unit no 4)Write apiece of Telephonic conversation based on a particular situation.	05
		B) Write an email or fax	05
Q.4	A)	Read the following passage and make notes out of it. Suggest suitable title. OR	
		(Unit No.5) Study the following notes and expand them into a passage.	05
		(Unit No.6) B) Study the following pie-diagram/table/flowcharts/tree diagram and write a paragraph with the help of it.	05

B.Sc.Sugar Technology Part I Semester-I
Subject Name: Applied Chemistry Paper-I
Sub Title: Organic And Sugar Chemistry

1)Introduction to sugar (8)

Introduction – Etymology, History (ancient time & middle age) Modern History 2) Chemistry of sugar, Constituents of sugar, Natural polymers of sugars, Flammability of sugar. 3) Types of sugar, Monosaccharides – Glucose, Fructose, Disaccharides - Sucrose, maltose, Lactose 4) Sources of sugar, Sugar beet, sugarcane 5) Refining of sugars 6) Sugar production countries 7) Forms of sugar and its use Consumption Health effects of sugar- Blood glucose level - Obesity and Diabetes
- Cardiovascular disease- Alzheimer's disease
- Tooth decays - Addiction forming
- Hyper activity- Measurement

Unit 2 – Carbohydrates [9]

- Introduction and Classification of Carbohydrates with suitable examples.
- Reactions of Monosaccharide such as
 - a) Mutarotation
 - b) Alkaline degradation
 - c) Rearrangements
 - d) Acidic degradation
 - e) Polymetrisation
 - f) Caramelisation

Unit 3 – Di & Polysaccharides [08]

- Structures and properties of sucrose, Maltose, Lactose, Starch & Cellulose (chain structures)

Unit 4 – Organic acids & Polyphenols [07]

- Organic acids & their effects on the processing of sugar house products.
- Polyphenols : Occurrence, classification & their effects on processing of sugar house products 14
- Organic acids & Polyphenols in cane juice & their characters.

Unit 5 – Physical & Chemical properties of sugar.(7)

- Chemical properties of sucrose :– sucrose molecule, crystalline sucrose, amorphous sucrose, aqueous sucrose.
 - Solution (solubility, density, viscosity, surface tension, boiling point, freezing point, rotation of polarized light)

- Physical properties of sucrose :- Structure of the sucrose molecule, sucrose derivatives, decomposition of sucrose
- Physical properties of reducing sugar :- Physical properties of dextrose solution (solubility, density, refractive index, optical rotation) Physical properties of invert sugar (solubility, refractive index, optical rotation)
- Chemical properties of dextrose & laevulose with organic reagent:- Acetone, benzoic, carbonate, acetate.
 - Chemical properties of dextrose & laevulose with inorganic reagent:- Phosphate sodium, chloride salt, calciumlevulate.
 - Decomposition reaction with alkaline solution & acid solution, oscillation reaction with iodine

Reference Books : Organic & Sugar Chemistry

- 1 Organic Chemistry : Hendrickson, Cram, Hammond
- 2 Organic Chemistry : Morrison & Boyd
- 3 Organic Chemistry : Volume I & II I.L.Finar
- 4 Organic Chemistry : Pine
- 5 Advanced Organic Chemistry : Sachin kumar Ghosh
- 6 Advanced Organic Chemistry : B.S.Bahl & Arun Bahi
- 7 A guide book to Mechanism in organic chemistry : Peter Sykes
- 8 Stereochemistry of organic compounds : Kalsi
- 9 Stereochemistry of Carbon compounds : Eliel
- 10 Text book of organic chemistry : P.L.Soni
- 11 Text book of practical organic chemistry : A.I.Vogel
- 12 Advanced organic chemistry : Reactions, Mechanism & Structure Jerry march
- 13 Organic Chemistry : M.R.Jain
- 14 Organic Chemistry : J.M.Shaigel
- 15 Organic Chemistry : Vol-I,II & III S.M.Mukharji, S.P. Singh, R.P.Kapoor (new age international Pvt,Ltd, Publishers)
- 16 Organic Chemistry : Bhupinder Mehta, Manju Mehta (Prentice – Hall of India Pvt,Ltd., New Delhi 110001)
- 17 Text book of organic chemistry : Finar Vol-I,II 16
- 18 Organic Chemistry : Fieser & Fieser
- 19 Organic Chemistry : Hendrikson Cram & Hammond

B.Sc.Sugar Technology Part I Semester-I

Subject Name: Applied Chemistry Paper-II

Sub Title: Physical and Inorganic Chemistry

Unit 1 – Solution & Strength of Solution [09]

- Definitions of the terms : Solute, solvent, solution & dilute solution.
- Concentration units : Normality, Molarity, molality, mole fraction, weight fraction, percentage composition by weight and volume.
 - Concentrations of bulk solutions used in laboratory and preparation of standard solutions from them (HCl, H₂SO₄, HNO₃ & ammonia)

Numerical problems.

Unit 2 – Chemical Kinetics : [09]

- Introduction : Rate of reaction, definition and units of rate constants, factors affecting the rate of reaction, order and molecularity of reaction.
 - First order reaction: Rate expression (Derivation not expected), characteristics of first order reaction.
 - Pseudounimolecular reactions such as
 - a) Hydrolysis of methyl acetate in presence of acid.
 - b) Decomposition of hydrogen peroxide (KMnO₄ method)
 - Second order reaction: Derivation of rate constants for equal & unequal concentrations of the reactants. Characteristics of second order reaction.
- Ex- a) Specification of ethyl acetate.
b) Reaction between K₂S₂O₈ & KI
- Chemical kinetics with respect to sucrose solution, effect of temp, pH retention time, sucrose inversion, destruction of reducing sugar.
 - Numerical problems.

Unit 3 – Chemical Bonding [09]

- Introduction & definition with example of each.
 - a) Ionic bond.
 - b) Covalent bond
 - c) Coordinate bond
 - d) Metallic bond
 - e) Hydrogen bond

f) Vander waal's forces.

Unit 4 – Corrosion & its prevention [09]

- Introduction, corrosion and its causes, classification, atmospheric corrosion : Corrosion due oxygen & other gases (Hydrogen embitterment & absorption mechanism, factors influencing corrosion, testing & measurement of corrosion by weight loss method, prevention of corrosion by proper design and material selection, cathodic & anodic protection, applications of metallic coatings by hot dipping, metal cladding, spraying & electroplating.

Unit 5 – Non sugars in sugar cane juice(05)

- Acids in cane juice-aconite acid, mallicacid, oxalic acid, citric acid, (%)
- Amino acids & portions in cane juice – (% & types)
- Organic non sugar of high molecular weight in cane juice- cellulose, hemicelluloses, lignin, protein, pectin, starch.
- Colored non sugar originally present in cane juice : chlorophyll, xanthophyll, carotene, anthocyanin.

Colored non sugar from sugar decomposition product –

a) caramel b) sugar decomposition product c) inversion of sucrose.

Reference Books : Physical & Inorganic Chemistry

- 1 Mathematical preparation of Physical chemistry : F.Daniel, Mcgraw hill
- 2 Elements of Physical chemistry : S.Glasstone & D.Lewis (D.van Nostrand Co-Inc)
- 3 Physical chemistry : W.J.Moore (Orient Longman)
- 4 Principles of Physical chemistry : Maron-Prutton
- 5 University chemistry : B.H.Mahan (Addision-Weseley)
- 6 Chemistry-Principle & Applications : P.W.Atkins, M.J.Clugsto, M.J.Fiazer, R.A.Y.Jone
- 7 Physical chemistry : G.M.Barrow (Tata Mc-Graw Hill)
- 8 Essentials of Physical chemistry : B.S.Bahl & G.D.Tuli
- 9 Physical chemistry : A.J.Mee
- 10 Physical chemistry : Daniels-Alberty
- 11 Principles of Physical chemistry : Puri-Sharma
- 12 Text book of Physical chemistry : Soni-Dharmarha
- 13 University General chemistry : CNR, RAo(MCMillan)
- 14 Chemistry : Sienko-Plane(Recent Edn.)
- 15 Basic Chemical Thermodynamics : V.V.Rao
- 16 Physical chemistry through problems : Dogra & Gogra (Wiley eastern Ltd.)
- 17 Physical chemistry : S.Glasstone
- 18 Text book of Physical chemistry : A.S.Negi & S.C.Anand (New age International Pvt.Ltd)
- 19 Text book of Engineering chemistry : M.M.Uppal, Khanna publishers, Delhi.
- 20 Text book of Engineering chemistry : S.S.Dara, S.Chand

B.Sc. Sugar Technology Part I Semester-II

Subject Name: Applied Chemistry Paper-III

Sub Title: (Organic & Biochemistry)

Unit – I Organosulphur Compounds (09)

- Organosulphur compounds :
- Introduction and nomenclature.
- Thiols (simple examples).
- Methods of formation
- Organosulphur compounds
- Carboxylic acids & their derivatives
- Metal Ligand bonding in Transition metal complexes.

(i) from sodium hydrosulphide and alkyl halide

(ii) from alcohol vapours and hydrogen sulphide

(iii) from Grignard reagent and sulphur.

Physical properties,

Chemical reactions

(i) Acidity-formation of mercaptide

(ii) Reaction with sodium

(iii) Reaction with carboxylic acids and acid chlorides

(iv) Reaction with aldehyde and ketones

(v) Oxidation

- Thioethers (simple examples),

Method of formation

(i) from potassium sulphide and alkyl halide

(ii) from salt of thiol and alkyl halide

(iii) from thiols and alkynes

- Physical properties.
- Chemical reactions:

(i) Reaction with alkyl halides

(ii) Oxidation to sulfoxide and sulphone

(iii) Addition to halogens.

- Fundamentals of Organic reaction mechanism

Meaning of reaction mechanism.

Curved arrow notation; drawing electron movements with arrows,

Half headed and double headed arrows

Example of each with mechanism

(a) Substitution (b) Addition (c) Elimination (d) Rearrangement.

Reactive intermediates with examples – Carbonations, Carbanions,

Free radicals, Carbenes, Arenes and Nitrenes.

Unit – II Sugar and polysaccharides.(09)

- Introduction to Di and Polysaccharides
- Stereochemistry and cyclic forms

- Sugar derivatives
- Glycoside bonds & cyclic forms
- Polysaccharides – amylose amylopectin & cellulose
- Glycosaminoglycans and proteoglycans
- Oligosaccharides of glycoproteins and glycolipids
- Lectins

Classification of carbohydrates

- a) Monosaccharides – classification of Monosaccharides
 - Ring straight chain isomerism
 - Use of monosaccharide in living organisms
- b) Disaccharides –
 - Introduction – nutrition – classification - metabolism - Metabolism – catabolism – carbohydrates – chemistry
- c) Carbohydrate acetalisation
- d) Cyanohydrin Reaction – Example, Reaction, mechanism, asymmetric synthesis
- e) Lobry-de Bruyn-van Ekenstein transformation
- f) Amadori rearrangement
- g) Nef reaction
- f) Wohl degradation
- i) Koenigs-Knorr reaction
- j) carbohydrate digestion
- k) Fermentation – Introduction, Definition, Examples, chemistry, ethanol, fermentation, Lactic acid fermentation, Heterolactic fermentation, Methane gas production In fermentation

Unit – 3 Cell as a biochemical entity : [09]

- Introduction to living cells, classifications of living cells, structure and function of cells, Structure and typical characteristics of DNA & RNA.
- Portions: Characteristics and classifications of proteins, protein structure, proteins in sugarcane juice.
- Amino acids: Classifications and properties, Amino acids in sugarcane juice and molasses.

Unit – 4 Carbohydrate Metabolism and Enzymes : [06]

- Carbohydrate metabolism: Glycolysis, TCA cycle, pentose phosphate pathway, Glyoxalate cycle.
- Enzymes: Definition, classification, mechanism of enzyme action, factors affecting reactivity, industrial applications of enzymes.

Unit – V Organic acids and polyphenols.(06)

- Definition of polyphenols
- Chemical reactions synthesis
- Structure
- Structural feature -Chemical properties and uses-Biological role in plant Occurrence in nature

B.Sc.Sugar Technology Part I Semester-II
Subject Name: Applied Chemistry Paper-IV
Sub Title:(Physical & Analytical Chemistry)

Unit – 1. Distribution Law [09]

- Nernst distribution law : Its limitations, and modification with reference to association and dissociation of solute in one of the solvents.

- Application of Distribution law in

i) Process of extraction (derivation expected)

ii) Determination of solubility

iii) Distribution of indicators

iv) Determination of molecular weight.

Unit - 2. Colloidal State: [10]

- Definition of colloids

- Types of colloidal systems.

- Solids in liquids (sols):

i) Preparation of sols: Dispersion and Aggregation methods

ii) Purification of Sols: Dialysis, Electrodialysis and Ultra-filtration.

iii) Properties of sols: Colour, optical, kinetic and electrical properties.

iv) Stability of sols, protective action, Hardy-Schulze law, gold number

Liquids in liquids (emulsions):

Types of emulsions, preparation, Emulsifier.

- Liquids in solids (gels):

Classification, preparation and properties, inhibition.

- General applications of colloids.

Unit – 3 Introduction to Analytical chemistry [09]

- Basic concept , errors , types of errors , accuracy, precision, statistical representation of analytical data.

Unit -4 Chromatography [10]

- Chromatography – Introduction, Classification of chromatographic methods, introduction of the terms used in chromatography.

- Thin Layer chromatography: introduction of basic concept of the technique, methodology, applications.

- Gas chromatography: General introduction to the terminology used, stationary phases, supports used in making GLC columns.

Practicals :

N.B.- a. Use of analytical or chainometric or Digital balance with 1 mg sensitivity is allowed

b. Use S.I. Units wherever necessary.

Group – A

- i) Determination of purity of phosphoric acid by Sodium hydroxide method
- ii) Determination of purity of phosphoric acid by Phosphomolybdate method.
- iii) Determination of purity of hydrogen peroxide
- iv) Determination of purity of hydros
- v) Determination of purity of formine
- vi) Determination of purity of caustic soda
- vii) Determination of purity of washing soda
- viii) Introduction to the instrumentation of GLC (Demonstration)

Group – B

- i) Determination of CaO content in lime by using pattern and Redder indicator.
- ii) To determine CaO content in given sample by EDTA Method
- iii) To determine CaO content in given sample by Ammonium Oxalate Method
- iv) Determination of content of mill sanitation chemical-Quaternary ammonium Compounds
- v) Determination of content of mill sanitation chemical –Dithocarbamate
- vi) To determine the phosphate contain in the given sample by Uranium Acetate Method
- vii) Determination of percentage of hydrochloric acid in commercial hydrochloric
- viii) Analysis of amino acids from the given sample with TLC.
- ix) Estimation of amino acids from sugar solution or sugarcane juice Spectrophotometrically
- x) Determination of polyphenols spectrophotometrically.

Semester – I

Sc-II : Applied Physics & Instrumentation I & II

Sc-II : Paper –I : Applied Physics –I (Properties of matter & Thermodynamics)

Unit 1 Surface tension : (10)

Explanation of surface tension : Angle of contact and

wettability, relation between surface tension, excess of pressure and radius of curvature, excess pressure in soap bubble and rise of liquid in capillary, effect of surface tension on evaporation and condensation, effect of impurity and temperature on surface tension.

Unit 2 Fluid Dynamics & Viscosity (10)

General concept of fluid flow, streamline and turbulent flow, the equation of continuity, Bernoullies equation, its application to venturimeter. Coefficient of viscosity, flow of liquid through the capillary tube, poiseuilles e, searle's viscometer, determination of viscosity by ostwald's viscometer.

Unit 3 Kinetic Theory of Gases :(09)

Molecule confirme Mean free path and its calculation (approximate method), ideal & real gases, deviation from ideal gas (Boyles law), Vander Waal's equation for real gas. Interpretation of temperature Andrew's curve , critical point, critical constants and their relation with Vander Waal's constants, reduced equation of state.

Unit 4 Thermodynamics:(09)

Idea of thermodynamic equilibrium, isothermal and processes, carnot's cycle, its efficiency and Carnot's theorem (heat engine), second law of thermodynamics, reversible and irreversible processes, entropy, its physical significance, entropy changes during fusion of a solid and vaporization of a liquid.

Reference Books :

- 1 Physics : S.G.Starling & Woodlal, Longmamas & green co.Ltd.
- 2 Textbook of properties of matter : N.S.Khare & S.Kumar, Atmaram & sons, New Delhi.
- 3 Physics Vol.I & II : Resnik & Halliday, Willey Ester ltd. New Delhi.
- 4 Treaties on heat : Shah & Shrivastava.
- 5 Kinetic Theory of gases : V.N.Kelkar
- 6 Heat & thermodynamics : Brijlal & Subramanyam, S.Chand & Co.Ltd, New Delhi.

Semester – II

Sc - II : Applied Physics & Instrumentation III & IV

Sc - II : Paper –III : Applied Physics -II (Optics and Crystallography)

Unit 1 Diffraction(10)

Types of diffraction, plane diffraction grating, construction, theory and its application to determine wavelength of light, resolving power, power of plane grating.

Unit 2 Polarization(10)

Idea of polarization, polarization by reflection, Brewster's law, polarization by refraction, pile of plates, double refraction, Huygens ex of refraction , Nicol prism, optical rotation – laws of rotation of plane of polarization, half shade polarimeter.

Unit 3 Laser and Optical fibers(09)

Interaction of radiation with matter- absorption, spontaneous and stimulated emission, meta-stable state, pumping, population inversion, types of lasers, properties of lasers, uses of laser (Medical and industrial), qualitative idea of holography. Principle and structure, types of optical fibers, propagation of light through fibre, properties of fibre, fibre optic communication system, sensors.

Unit 4 Crystallography(09)

Space lattice, basis and crystal structure, unit cell, coordination number, packing fraction, calculation of lattice constants, Miller indices of plane, sketches of different planes, relation between interplaner distance and Miller indices. Bragg's law, Bragg's X-ray spectrometer, X-ray diffraction, Laue method and powder method.

Reference Books :

- | | | | |
|---|-------------------------------------|---|---|
| 1 | Geometrical & Physical optics | : | D.S.Mathur |
| 2 | Textbook of optics (New Edition) | : | Brijlal & Subramananyam |
| 3 | Fundamentals of optics | : | Jenkins & White |
| 4 | Optics (Second Edition) | : | Ajay Ghatak |
| 5 | Laser and non-linear optics | : | B.B.Laud |
| 6 | Introduction to solid state physics | : | Charles Kittel |
| 7 | Solid state physics | : | S.O.Pillal, Eastern Ltd, New age international Ltd. |

Sc- II : Paper II : Instrumentation-I

Unit I Introduction to Instrumentation(10)

What is instrumentation, Introduction of Industrial Instrumentation, Characteristics of instruments, Static characteristics and Dynamic Characteristic Fundamentals & Derived Units, Temperature pressure, mass, vacuum, flow, What is error? Type of error.

Unit II Transducers(10)

Transducer & servomechanism, Introduction of transducer, Difference between sensor & transducer, Classification of transducer, a) Active b) passive, Study of transducer used for 1) Level 2) Temp-thermometer/RTD 3) Flow 4) Pressure 5) Vacuum, Servomechanism

Unit III Liquid and Temperature Measurement(09)

Liquid level measurement : Direct Method : Liquid level indicators, Direct Method : Hook type, sight glass, float type.
Indirect Method : Capacitance level indicator, Radiation level indicator, Temperature measurement, Electrical resistance thermometer, Bimetallic thermometer, Thermocouples – Types of thermocouples, Optical pyrometer – Radiation pyrometer.

Unit IV Pressure and flow Measurement(09)

Pressure measurement, Type of pressure measuring device
a) Bourdon Tube b) monometer c) U-type, well type & barometer vacuum measurement, Flow meter, Total flow, volumetric flow, mass flow, Flow transducers such as :
Orifice plates, pito tube, venturimeter variable area flow meter, rotameter, magnetic flow meter, mass flow meter.

Reference Books:

- 1 R.N.Shreve : The chemical process industries (MGH)
- 2 W.I.Badger & J.T.Bandchero : Introduction to Chemical Engineering (MGH)
- 3 O.A.Hougen, R.M.Watson & R.A.Ragetz : Chemical process principles (Vol. I,II(JW))
- 4 Industrial Instrumentation & control : S.K.Singh Tata McGraw-Hill Publishing Company Limited, New Delhi
- 5 Instrumentation : F.W.Kirk & N.R.Rimbol
- 6 Theory of Errors : Yardley Beers.

Sc - II : Paper –IV : Instrumentation – II

Unit I Spectrophotometer(08)

General principles of absorption spectroscopy, Colorimetry – construction & working, Beer & lamberts law, Standard curve & application

Unit II Flame Photometer(08)

Basic principle, Elementary theory, Construction Instrumentation of flame photometer, Parameter a) Flame b) monochromators c) detectors, Application of Spectrophotometer

Unit III Polarimetry(08)

Introduction, Plane polarized light, Instrumentation system of polar meter, Application of polar meter in sugar Technology, Refractometry , Introduction Snell's Law – Specific refraction Molar refraction – Abbes Refract meter

Unit IV PH & Conductivity measurements(06)

pH meter, Instrumentation of pH meter, Conductivity meter
Instrumentation of conductivity meter, Wheatstone bridge ckt,
Conductivity cell application

Unit V Singal Conditioner (06)

What is single conditioner, Need of signal conditioner

Operational Amplifier, Current to voltage (I to V), Analog to

Digital Converter (A to D), Digital to Analog converter (D to

A) Display & records, Digital Vs Analog, Instruments / Displays

Seven Segments Displays, Recorders - a) Need of Recorder

b) Analog Recorders c) Graphic Recorders d) Strip chart

Recorders e) X-Y Recorders

Reference Book –

1. A.K. Shawny
2. Process control A.P.Kulkarni
3. Instrumental methods of Chemical analysis by H.Kaur.
4. Instrumental methods of analysis by Strobel.
5. Instrumental methods of chemical analysis by Bhal and Tuli

Practical's: Group-A(Physics)

- 1) Measurement of angle of rotation on Automatic polar meter.
- 2) To find the Recovery of Sugar in Juice by Polari meter.
- 3) To find Purity of Sugar by Polari meter.
- 4) To find purity of masecuite by Polari meter.
- 5) To Find the Viscosity of Juice by Viscometer.
- 6) To Find the Viscosity of Syrup by Viscometer.
- 7) To Find the Viscosity of Masecuite by Viscometer.
- 8) To Study the handling of spectrophotometer.
- 9) To determine the refractive index of Juice/sugar Solution by using Abbe's refractometer.

Practical's: Group-B(Instrumentation)

- 1)To study the different types of Transducers and Sensors
- 2)To study the Orifice meter.
- 3)To study the Venturimeter.
- 4)To Study the Temperature measurement using Thermocouple.
- 5)To study the Flame Photometer.
- 6)To study the measurement of Pressure.
- 7)To study the Float type liquid level measurement.
- 8)To study the Refract meter instruments.
- 9)To study and Use Of pH meter.

Semester – I
B.Sc. – I Applied Mathematics & Statistics I & II
Paper – I Physical Applied Mathematics – I

Unit 1 General equation Theory(09)

General equation of plane, normal form intercept form, two parallel planes, Angle between two planes. Equation of a plane, passing through a point. Direction of normal to the plane, plane passing through three points. Distance of a point from plane, straight line in three dimensional. Equation of straight line symmetric form of equation of straight line Intersection of line & plane line passing through a point at perpendicular to given plane. Intersection of two lines, image of a point in a plane.

Unit 2 Trigonometric ratios. (10)

Trigonometric ratios of some standard angles. Trigonometric identities & their derivations. Trigonometric ratios of double and triple angle.

Unit 3 Determinants and matrices(09)

Evaluation of determinants. Fundamental properties of determinants. Cramer's rule. Solutions of homogeneous & non-homogeneous equations. Types of matrices. Algebra of matrices, multiplication of matrices. Inverse of a matrix, application of matrices to solve system of simultaneous equations. Rank of a matrix.

Unit 4 Function(09)

Types of functions. Algebraic functions, exponential functions, trigonometric functions, logarithmic functions. Algebra of functions. Increasing & decreasing functions. Concept of limit. Limit of a function. Algebra of limits. Method of evaluation of limits. Evaluation of limit of a function at infinity. Continuity of a function.

Reference Books :

- 1 Analytical Geometry of two dimensions : R.M.Khan, Allied pub, Colkatta.**
- 2 A text book of Matrices : Shantinarayan, S.Chand & company, New Delhi.**
- 3 A text book of Engineering Mathematics : N.P.Bali, S.Chand & company, New Delhi.**
- 4 Differential Calculus : shantinarayan, S.Chand & company, New Delhi.**
- 5 Algebra & Geometry : H.V.Kumbhojkar, Nirali Prakashan.**

Semester – II
B.Sc. – I Applied Mathematics & Statistics III & IV
Paper – III Applied Mathematics – II

Unit 1 Derivative of a function.(09)

Derivative of some standard functions from first principle. Algebra of derivatives, rules of differentiation with regards to sum, product, difference & quotient of two functions. Derivative of some simple composite function, chain rules. Second order derivatives. Maxima & minima of a function of single variable and two variables. Application of derivatives tangent & normal, velocity & acceleration.

Unit 2 Integration :(09)

Integration of a given function & method of evaluation of integrals. Definite & indefinite integrals. Geometrical interpretation of definite integral as area & volume of revolution under respective curves. Length of a curve.

Unit 3 Differential equations:(09)

Variable separable form, homogeneous & non- homogeneous differential equations. Exact differential equation, linear differential equation of first order. Bernoulli form of differential equation.

Unit 4 Application of Differential equations(10)

Law of growth & decay, Newton's law of cooling, orthogonal trajectories of curves, Chemical reactions & solutions. Conduction of heat.

Reference Books :

- 1 Ordinary & Partial Differential Equations : M.D.Raisinghania Analytical, S.Chand & company, New Delhi.
- 2 Differential Equations : H.V.Kumbhojkar, Nirali Prakashan.
- 3 Differential Equations : Agashe
- 4 Integral Calculus : Shantinarayan, S.Chand & company, New Delhi.
- 5 A text book of Engineering Mathematics : N.P.Bali, Manish Goyal, Laxmi publication

Practicals: Group – A (Mathematics)

1. Finding of distance between two parallel lines
2. Determination of eigen values and eigen vectors of a matrix.
3. Verification of Cayley -Hamilton Theorem for a square matrix.
4. Application of Differential Equation to Electric circuits.
5. Application of Differential Equation to Chemical Problems.
6. Orthogonal trajectories to curves, Use of Graph paper is recommended.
7. Newton's law of cooling.
8. Law of growth.
9. Law of decay.
10. Chemical Reactions and solutions.
11. Conduction of heat.
12. Determination of an angle θ with which coordinate axes be rotated so that the conic

$$ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$$

is transformed to new co-ordinate axes to the form a 'x

$$'^2 + b'y'^2 + 2g'x' + 2f'y' + c' = 0 .$$

13. Area bounded by a curve.
14. Volume bounded by a curve.
15. Extreme values of a function of two variables by Lagrange's Method.

Sc - III : Paper– II : Applied Statistics – I

Unit-1 Introduction: (06)

Meaning and scope of statistics, Population and Sample, concept of sample with illustrations, methods of sampling.

Data: Raw data, Attributes and variables, discrete and continuous variables, frequency distribution. Graphical Representation: Histogram, Ogive Curves and their uses.

Unit-2 Measures of central tendency and dispersion : (14)

Concept of central tendency, Criteria for good measures of central tendency.

Arithmetic mean: Definition for ungrouped and grouped data, combined mean, weighted mean.

Median: Definition, formula for computation for ungrouped and grouped data, graphical method.

Mode: Definition, formula for computing for ungrouped and grouped data.

Measures of Dispersion : Concept of dispersion, measures of dispersion, absolute and relative measures of dispersion, Range and its coefficient, Quartile Deviation and its coefficient, Standard deviation and its coefficient, Variance, coefficient of variation.

Unit-3 Moments and Measures of Skewness and Kurtosis (07)

Raw and central moments (only first four moments), Relation between central and raw moments,

Skewness: Skewness of a frequency distribution, positive and negative skewness, Measures of skewness based on moments.

Kurtosis: Leptokurtic, platykurtic and mesokurtic distributions.

Measures of kurtosis based on moments.

Unit-4 Correlation and regression (for ungrouped data) (09)

Bivariate data, Concept of correlation, positive correlation, negative correlation, scatter diagram, Karl Pearson's coefficient of correlation, Spearman's Rank Correlation coefficient.

Regression: Concept, lines of regression, least square method, regression coefficients, relation between correlation and regression coefficients.

Reference Books –

1. Bhat B. R., Srivenkatramana T. and Madhava Rao K. S. (1996): Statistics: A Beginner's Text, Vol. 1, New Age International (P) Ltd.
2. Croxton F. E., Cowden D.J. and Kelin S. (1973): Applied General Statistics, Prentice Hall of India.
3. Goon A.M., Gupta M.K., and Dasgupta B.: Fundamentals of Statistics Vol. I and II, World Press, Calcutta.
5. Gupta S. P. (2002): Statistical Methods, Sultan Chand and Sons, New Delhi.
6. Hogg R. V. and Crag R. G.: Introduction to Mathematical Statistics Ed.4.
7. Hoel P. G. (1971): Introduction to Mathematical Statistics, Asia Publishing House.

Unit 1 Probability (10)

Concept of random experiment, sample space, finite & countable infinite sample space, discrete sample space, events, types of events, power set, classical (apriori) definition of probability of an event, equiprobable sample space, axiomatic definition of probability.

i) $p(\emptyset) = 0$ ii) $p(A') = 1 - p(A)$

iii) $p(A \cup B) = p(A) + p(B) - p(A \cap B)$

iv) If $A \subseteq B$ then $p(A) \leq p(B)$

v) $0 \leq p(A \cap B) \leq p(A) \leq p(A \cup B) \leq p(A) + p(B)$

simple examples.

Unit 2 Conditional probability & independence of events:(10)

Independence of two events, statement of the result that if A and B are independence events then i) A and B' ii) A' and B iii) A' and B' are also independent, examples. Definition of conditional probability, partition of sample space. Baye's theorem (only statement)

Unit 3 Univariate probability distributions(09)

Definitions: discrete random variable, probability mass function (pmf), cumulative distribution function(cdf), properties of c.d.f., median, mode & examples. Definition of expectation of random variable, expectation of function of random variable.

i) $E(c) = c$, where c is constant.

ii) $E(aX + b) = a E(X) + b$, where a and b are the constants. Definition of mean and variance of univariate distributions.

Unit 4 Some standard discrete probability distributions.(09)

Discrete uniform distribution: pmf, mean & variance.

Binomial distribution: pmf, mean & variance, additive property, recurrence relation for probabilities.

Hyper geometric distribution: pmf, mean & variance

Poisson distribution: pmf, mean & variance, additive property, recurrence relation for probabilities.

Reference Books :

- 1) Bhat B.R.Srivenkatramana T. and Madhava Rao K.S.(1996) : Statistics :A Beginner's Text, Vol.1, New age International (P) Ltd.
- 2) Croxton F.E., Cowden D.J. and Kelin S.(1973) : Applied General Statistics, Prentice Hall of India.
- 3) Edward P.J.Ford J.S. & Lin(1974) : Probability for Statistical Decision Making, Prentice Hall.
- 4) Goon A.M.Gupta M.K. & Dasgupta B. : Fundamentals of Statistics Vol.I &II, World press, Calcutta.

- 5) Gupta S.P.(2002) : Statistical Methods, Sultan Chand & Sons, New Delhi.
- 6) Hogg R.V. & Crag R.G. : Introduction to Mathematical Statistics Ed.4.
- 7) Hoel P.G.(1971) : Introduction to Mathematical Statistics, Asia Publishing House
- 8) Meyer P.L. (1970) : Introductory Probability & Statistical Applications, Addison Wesley.
- 9) Mood A.M., Graybill F.A. & Boes D.C. (1974) : Introduction to the Theory of Statistics, McGraw Hill.
- 10) Rohatgi V.K. & Saleh A.K.Md.E. (2002) : An Introduction to Probability & Statistics. John wiley & Sons (Asia)
- 11) Snedecor G.W. and Cochran W.G. (1967) : Statistical Method, Iowa State University Press.
- 12) Waiker & Lew : Elementary Statistical Methods.
- 13) Gupta V.K. & Kapoor S.C. Fundamentals of Mathematical Statistics : Sultan & Chand.

Practicals Group – B (Statistics)

1. Graphical presentation of the freq. distribution (Histogram, Ogive curves)
2. Measures of Central tendency
3. Measures of the Dispersion
5. Moments, Skewness & Kurtosis
6. Correlation coefficient Regression
7. Applications of Binomial Distribution.
8. Applications of Hyper geometric Distribution.
9. Application of Poisson Differential

B.Sc.Sugar Technology Part I Semester-I
Subject Name: Sugar Manufacturing Paper-II
Sub Title: (Juice Extraction & Clarification)

Unit 1 (9)

- Extraction of juice from cane.
- Maceration /Imbibitions & their scheme
- Mill sanitation & types of biocides

Unit 2 (9)

- Weighment of juice by semiautomatic & fully automatic weighing scale Weighment of juice by various flow meters, important of juice flow stabilization.
- Preparation of sulphur-di-oxide (gas), continuous & film type sulphur burner, their construction & operation. Quality & quantity of air required for SO₂ gas production.
- Preparation of milk of lime, lime slacker & classifier their construction & operation. Removal of grit & their important.
- Preparation of phosphate solution & role of phosphate in juice clarification.

Unit 3 (9)

- Comparison of cane & juice.
- Principle of cane juice clarification
- Influence of lime on the different constituents of juice
- Effect of PH on cane juice
- Effect of temperature on juice
- Effect of retention time of juice

Unit 4 (5)

- Different type of cane juice clarification
 - a) Defecation process
 - b) Sulphitation process
 - c) Carbonation process their merits & demerits.

Unit 5 (6)

- Heating of juice, different type of juice heater, their construction & operation
 - Settling of juice, different type of clarifier, their construction & operation
- Filtration of juice, different type of filters, their construction & operation

Reference books:

- 1 Hand of book of cane sugar : Meade & Chen
- 2 Introduction to cane sugar : Jenkins G.H.
technology
- 3 Unit operation in cane sugar : John H.Payne
production
- 4 Manufacture of sugar from sugarcane : C.C.M.Perk

- 5 Efficient Management for sugar factories : Mangal Singh
- 6 Cane sugar manufacture in India : D.P.Kulkarni

B.Sc.Sugar Technology Part I Semester-II
Subject Name: Sugar Manufacturing Paper -IV
Sub Title: (Evaporation)

Unit 1 Evaporation Theory (9)

- Quantity of water to be evaporated from juice
- Highest limit of syrup brix
- Heat transfer in evaporator
- Live steam/exhaust steam
- Boiling Point of juice
- Upper & lower limit of juice boiling temperature
- Norbert rillieux principle

Unit 2 Evaporator Construction (8)

- General construction of evaporator of bodies
 - a) Robert type
 - b) Semikester type (LTRE)
 - c) Falling film type (FFE)
- Entrainment & Entrainment Separator
 - a) Helmet type
 - b) Centrifugal type
 - c) Poly baffle type
- Evapour pipe & its diameter calculation
- Condenser & their type

Unit 3 Evaporator Operation (8)

- Off season testing
- Starting of evaporator set
- Juice level in evaporator bodies
- Condenset removal
- Non condensable gases removal
- Stopping of evaporator set

Unit 4 Vapor bleeding & steam economy (6)

- Basic requirement of steam in sugar factory
- Steam consumption with vapor bleeding to juice heater
- Steam consumption with vapor bleeding to juice heater & pan

Unit 5 Treatment (7)

- Scale formation & treatment for removal
- Syrup treatment & their advantage

Reference books:

- 1 Hand of book of cane sugar : Meade & Chen
- 2 Introduction to cane sugar technology : Jenkins G.H.
- 3 Unit operation in cane sugar production : John H.Payne
- 4 Manufacture of sugar from sugarcane : C.C.M.Perk
- 5 Efficient Management for sugar factories : Mangal Singh
- 6 Cane sugar manufacture in India : D.P.Kulkarni

B.Sc.Sugar Technology Part I Semester-I
Subject Name: Sugar Cane Agriculture-I

Unit 1 Introduction, Origin, Distribution & Botany of Sugarcane (9)

- Common name, English name, Botanical name, Classification up to genus.

- Centers of sugarcane origin.
- Distribution – Indian sugar industry on global screen, Sugarcane area, production & productivity in India.
- External morphology.
- Internal morphology-root, stem and leaves.

Unit 2 Sugarcane cultivation practices (9)

- Soil & sugarcane nutrition
- Climatic conditions for sugarcane
- Cultivation practices- Preparation of soil, sugarcane planting methods: planting in flat beds, ridges & furrows method, pit planting, bud transplanting, weeds & their control (Chemical & Biological control methods)

Unit 3 Agronomy (9)

- Maturing (Response of sugarcane crop to FYM & Chemical fertilizers, micronutrient). Soil application & foliar application.
- Irrigation and its methods- Furrow, sprinkler and drip method.
- Sugarcane maturity, ripening, harvesting & ratoon management.

Unit 4 Sugarcane pathology (10)

- Diseases of sugarcane with special reference to causal organism, symptoms and its control measures.
 - a) Fungal: Red rot, Whip smut
 - b) Bacterial : Leaf scald, red strips.
 - c) Viral & Mycoplasmal : Mosaic & Grassy shoot.
- Pests of sugarcane with special reference to morphology, symptoms and its control measures.
 - a) Termites, b) Shoot borer, c) White flies, d) Armyworms.

B.Sc.Sugar Technology Part I Semester-II
Subject Name: Sugar Cane Agriculture-III

Unit 1 Breeding techniques in Sugarcane.(9)

- Introduction, varieties, scope of varietal planting, cytology
- Raising of seed cane crop-Ideal seed cane, seed cane treatment, measures to obtain higher germination, transplanting technique and its advantages.

Unit 2 Breeding Methods.(10)

- Introduction & germ plasma collection.
- Clonal selection.
- Hybridization
- Mutation breeding.

Unit 3 Objectives of sugarcane breeding(10)

- Breeding for yield, logging, resistance to diseases, resistance to insect pests & quality.
- Sugarcane breeding institutes in India.

Unit 4 Physiology of sugarcane(9)

- Physiology of sugarcane under normal conditions.
- Physiology of sugarcane under saline conditions.
- Rapid screening parameters for salt stress.
- Agro-technology to improve germination under saline conditions.
- Work on the physiology of various sugarcane clones.

Practicals : Group – A (sugarcane Agriculture)

Study of external morphology of sugarcane plant.

- 1) Study of internal morphology of sugarcane plant- T. S. of root,
- 2) Study of internal morphology of sugarcane plant- T. S. of stem
- 3) Study of internal morphology of sugarcane plant- T. S. of leaf.

- 4) Determination of soil pH (Any suitable method).
- 5) Study of soil texture.
- 6) Determination of humus content (fertility) of the soil sample.
- 7) Study of deficiency symptoms of macronutrients (N, P, K) in sugarcane plant.
(Demonstration)
- 8) Study of sugarcane diseases- red rot, whip smut, leaf scald.
- 9) Study of sugarcane diseases red strips, mosaic and grassy shoot.
- 10) Study of sugarcane pests- termites, shoot borer, white flies and
armyworms.
- 11) Study of different types of fertilizers. (Demonstration)

- 12) Study of different varieties of sugarcane with special reference to morphology, sugar percentage, yield. (Any four varieties available in the area).
- 13) Study of dimorphic chloroplast (Kranz anatomy) in sugarcane leaves.
- 14) Breeding techniques in sugarcane.

Occasional Field Work will be arranged to demonstrate various cultivation practices.

Reference Books:

- 1) Hartmann and Kester's -Plant propagation- Principles and practices- Hudscan T. Hartmann, Dale E. Kester, Fred T. Davies, Jr. Robert L. Geneve.
- 2) Textbook of Plant Physiology- C. P. Malik
- 3) Diseases of Crop Plants in India- G. Rangaswami and A. Mahadevan
- 4) Plant Pathology- R. S. Mehrotra
- 5) Practical cytology – Applied Genetics and Biostatistics- H. K. Goswami and Rajeev Goswami.
- 6) Recent Advances in Plant Diseases Vol- 1 to 5 – K. M. Chandniwala
- 7) Introduction to Principles of Plant Pathology – R. S. Singh.
- 8) An Introduction to Plant Anatomy- Authur R. Eames and Laurence H. Mac Deniels
- 9) Genetics and Plant Breeding- E. B. Babcock
- 10) Plant Taxonomy – O. P. Sharma.
- 11) Plant Breeding- Theory and Techniques – S. K. Gupta.
- 12) Breeding Asian Field Crops- John Milton Poehlman and Dhirendranath Borthakur.
- 13) Crop Production and Field Experimentation- Dr. V. G. Vaidya, K. R. Sahasrabudhe, Dr. V. S. Khuspe.
- 14) Agricultural Problems of India- A. N. Agrwal and Kundam Lal

15) Elementary Principles of Plant Breeding- H.K. Chaudhari.

16) Trends in Agricultural Insect Pest Management- G. S. Dhaliwal and Ramesh Arora.

Practicals : Group – B (Sugar manufacture)

- i) To determine the Brix of the given sample by Bx Hydrometer & Handrefractometer
- ii) To find out the Purity of given sample of Juice.
- iii) To determine the Purity of Syrup and Molasses
- iv) To determine the purity of the Masecuite
- v) To determine the Pol % and Moist % of the Bagasse
- vi) To determine the Pol % and Moist % of the Filtercake

- vii) To determine the pH of the given sample by
 - a. Test Paper
 - b. Helige comparator
 - c. pH meter
- viii) To determine the phosphate contents in the given sample by Spectrophotometer
- ix) To determine the Reducing sugar by Eyon & lane Method
- x) To determine the Reducing sugar by Potassium Ferrocynide Method
- xi) To determine the Reducing sugar by Luffs Method
- xii) To determine the Reducing sugar by Colorimetric Method