Shivaji University, Kolhapur

Choice Based Credit System (CBCS)

B. Sc. Part-I

Sugar Technology (Entire)

Under Faculty of Science & Technology

(To be implemented from Academic Year 2018-19)

❖ Guidelines shall be as per B. Sc. Regular Program

❖ Rules and Regulations shall be as per B. Sc. Regular Program except CBCS R. B. Sc. 3 Structure of Program and List of Courses.

❖ Preamble :

In India sugarcane becomes industrial crop and sugar industry becomes as integrated cane processing unit wherein sugar, alcohol, energy and allied products are manufactured thus it is needed to provide technologist and scientists to the industry. At present there are two institutes which provide technical education related to the sugar industry. Namely National sugar institute Kanpur which is approved by Govt.of india. Dept. Of Food and Agriculture and Vasantdada Sugar Institute Pune which is approved by state govt of Maharashtra and it is autonomous institute. Both the institutes are providing the education in the faculty of Sugar technology, Sugar engineering, Alcohol Technology, and Instrumentation Engg, in the capacity of Post Graduates Diploma... But in India there is no provision for the Bachelor in Sugar technology. Recently Maharashtra govt. permitted to start such a carrier oriented courses under science faculty, according we are running B.Sc (.sugar technology)course since last five academic years .

❖ Structure of Program and List of Courses are as follows:

CBCS B. Sc. 3: Structure of B. Sc. Sugar technology Entire Programme Sem I & II

Structure – I

Sr. No.	Course (Subject) Title	TEACHING SCHEME						EXAMINATION SCHEME						
		THEORY			PRACTICAL			THEORY				PRACTICAL		
		Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Hours	Max	Total Marks	Min	Hours	Max	Min
S E M E S T E R – I (Duration – 6 Months)														
1	DSC-ST	2	5	4	2	4	3.2	2	50	100	35			
2	DSC-ST	2						2	50					
3	DSC-ST	2	5	4	2	4	3.2	2	50	100	35			
4	DSC-ST	2						2	50					
5	DSC-ST	2	5	4	2	4	3.2	2	50	100	35			
6	DSC-ST	2						2	50			PRACTICAL EXAMINATION IS ANNUAL		
7	DSC-ST	2	5	4	2	4	3.2	2	50	100	35			
8	DSC-ST	2						2	50					
9	AECC-A	2	4	3.2	-----	-----	-----	2	50	50	18			
	Total	18	24	19.2	8	16	12.8	-		450				
S E M E S T E R – II (Duration – 6 Months)														
1	DSC-ST	2	5	4	2	4	3.2	2	50	100	35		50	18
2	DSC-ST	2						2	50					
3	DSC-ST	2	5	4	2	4	3.2	2	50	100	35		50	18
4	DSC-ST	2						2	50			As per BOS Guide-lines		
5	DSC-ST	2	5	4	2	4	3.2	2	50	100	35		50	18
6	DSC-ST	2						2	50					
7	DSC-ST	2	5	4	2	4	3.2	2	50	100	35		50	18
8	DSC-ST	2						2	50					
9	AECC-B	2	4	3.2	-----	-----	-----	2	50	50	18			
	Total	18	24	19.2	8	16	12.8	-		450			200	
	Grand Total	36	48	38.4	16	32	25.6			900				

- Student contact hours per week : 32 Hours (Min.)
- Theory and Practical Lectures   : 48 Minutes Each
- Total Marks for B.Sc.-I (Including English) : **1100**
- Total Credits for B.Sc.-I (Semester I & II) : **52**

- **DSC** – Discipline Specific Core course : All papers are compulsory.
- **AECC** – Ability Enhancement Compulsory Course (A & B)- English

- Practical Examination will be conducted annually for 50 Marks per course (subject).

- ***There shall be separate passing for theory and practical courses.***

(A) Non-Credit Self Study Course : Compulsory Civic Courses (CCC)
For Sem I: CCC – I : Democracy, Elections and Good Governance

(B) Non-Credit Self Study Course : Skill Development Courses (SDC)
For Sem II: SDC – I : Any one from following (i) to (v)
i) Business Communication & Presentation ii) Event management iii) Personality Development, iv) Yoga & Physical Management v) Resume, Report & proposal writing

ii) Structure of B. Sc. Sugar technology Programme Sem III & IV

Structure - II

Sr. No.	Course (Subject) Title	TEACHING SCHEME THEORY Credits	No. of lectures	Hours	PRACTICAL Credits	No. of lectures	Hours	EXAMINATION SCHEME THEORY Hours	Max	Total Marks	Min	PRACTICAL Hours	Max	Min
S E M E S T E R – III (Duration – 6 Months)													
1	DSC-ST	**2**	3	2.4	4	6.4	8	2	50	100	35			
2	DSC-ST	**2**	3	2.4				2	50					
3	DSC-ST	**2**	3	2.4	4	6.4	8	2	50	100	35	PRACTICAL EXAMINATION IS ANNUAL		
4	DSC-ST	**2**	3	2.4				2	50					
5	DSC-ST	**2**	3	2.4	4	6.4	8	2	50	100	35			
6	DSC-ST	**2**	3	2.4				2	50					
7	AECC-C	**4**	4	3.2	---	---	---			---	---			
	TOTAL	**16**	**22**	**17.6**	**12**	**19.2**	**24**			**300**	---			
S E M E S T E R – IV (Duration – 6 Months)													
1	DSC-ST	**2**	3	2.4	4	6.4	8	2	50	100	35	As per BOS Guide-lines	100	35
2	DSC-ST	**2**	3	2.4				2	50					
3	DSC-ST	**2**	3	2.4	4	6.4	8	2	50	100	35		100	35
4	DSC-ST	**2**	3	2.4				2	50					
5	DSC-ST	**2**	3	2.4	4	6.4	8	2	50	100	35		100	35
6	DSC-ST	**2**	3	2.4				2	50					
7	AECC- C AECC- D	---	---	---	---	---	---	3	70 / 30	100	25 / 10	---	---	---
	TOTAL	**12**	**18**	**14.4**	**12**	**19.2**	**24**			**400**	---			
		28	**40**	**32**	**24**	**38.4**	**48**			**700**	--	---	**300**	

- Student contact hours per week : 32 Hours (Min.)
- Theory and Practical Lectures : 48 Minutes Each
- Total Marks for B.Sc.-II (Including EVS) : **1000**
- Total Credits for B.Sc.-II (Semester III & IV) : **52**
- **DSC : -** Discipline Specific Core Course : All papers are compulsory.
- **AECC-** Ability Enhancement Compulsory Course (C) : Environmental Studies: EVS (Theory – 70 & Project – 30 Marks)
- Practical Examination will be conducted annually for100 Marks per course (subject).
- *There shall be separate passing for theory and practical courses also for Environmental Studies.*

ii) Structure of B. Sc. Programme Sem V & VI

Structure - III

Sr. No.	Subject Title	TEACHING SCHEME						EXAMINATION SCHEME						
		THEORY			PRACTICAL			THEORY				PRACTICAL		
		Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Hours	Theory	Internal	Min Marks	Hours	Max Marks	Min Marks
SEMESTER – V (Duration – 6 Months)														
1	DSE-E	2	3	2.4				2	40	10	14+4=18	PRACTICAL EXAMINATION IS ANNUAL		
2	DSE-E	2	3	2.4				2	40	10	14+4=18			
3	DSE-E	2	3	2.4	8	20	16	2	40	10	14+4=18			
4	DSE-E1/E2/E3	2	3	2.4				2	40	10	14+4=18			
5	AECC-E	2	4	3.2	---	---	---	2	40	10	14+4=18			
	TOTAL	**10**	**16**	**12.8**	**8**	**20**	**16**		**200**	**50**	---			
SEMESTER – VI (Duration – 6 Months)														
1	DSE-F	2	3	2.4				2	40	10	14+4=18	As per BOS Guidelines	200	70
2	DSE-F	2	3	2.4				2	40	10	14+4=18			
3	DSE-F	2	3	2.4	8	20	16	2	40	10	14+4=18			
4	DSE-F1/F2/F3	2	3	2.4				2	40	10	14+4=18			
5	AECC-F	2	4	3.2	---	---	---	2	40	10	14+4=18	---	---	---
	TOTAL	**10**	**16**	**12.8**	**8**	**20**	**16**		**200**	**50**	---			
	GRAND TOTAL	**20**	**32**	**25.6**	**16**	**40**	**32**		**400**	**100**	--	---	**200**	

- Student contact hours per week : 32 Hours (Min) • • Total Marks for B.Sc.-III (Including English) : 700
- Theory and Practical Lectures : 48 Min. Each • • Total Credits for B.Sc.-III (Semester V & VI) : 36
- **DSE- Discipline Specific Elective :** All papers are compulsory. **Except DSC E1/E2/E3 & DSC F1/F2/F3**
- **AECC-** Ability Enhancement Compulsory Course (E & F) : English
- Practical Examination will be conducted annually for 200 Marks.
- *There shall be separate passing for theory, internal and practical.*

(A) Non-Credit Self Study Course : Compulsory Civic Courses (CCC)
For Sem V: CCC – II : Constitution of India and Local Self Government

(B) Non-Credit Self Study Course : Skill Development Courses (SDC)
For Sem VI: SDC – II: Any one from following (vi) to (x)
vi) Interview & Personal Presentation Skill, vii) Entrepreneurship Development Skill, viii) Travel & Tourism, ix) E-Banking & Financial Services, x) RTI & Human Right Education (HRE), IPR & Patents

CBCS B. Sc. : Sugar technology Entire : List of courses:

i)   B. Sc. Part 1 (Sem I & II),

Course code	Name of Course	Course code	Name of Course
Sem I		**Sem II**	
DSC ST1	Applied Chemistry – I (Sugar chemistry)	DSC ST9	Applied Chemistry – II(Organic chemistry)
DSC ST2	Applied Chemistry – I (Bio chemistry)	DSC ST10	Applied Chemistry – II (Physical chemistry)
DSC ST3	Applied Physics-I (Properties of Material & Thermodynamics)	DSC ST11	Applied Physics-II (Basic Instrumentation)
DSC ST4	Applied Physics-I (Optics & Crysatllography)	DSC ST12	Applied Physics-II (Sugar Instrumentation)
DSC ST5	Applied Maths-I (Algebra & Geometry)	DSC ST13	Applied Maths-II (Descriptive statstics)
DSC ST6	Applied Maths-I (Differential Integration & calculus)	DSC ST14	Applied Maths-II (Probability Theory)
DSC ST7	Sugarcane Agriculture– I (Sugar cane Agronomy)	DSC ST15	Sugar manufacturing– I (Clarification)
DSC ST8	Sugarcane Agriculture– I (Sugar cane Pathology)	DSC ST16	Sugar Manufacturing– I (Evaporation)
AECC – A	English – I	AECC – B	English – II

Practical

DSC STP1	Applied Chemistry I & II	DSC STP3	Sugar Cane Agriculture –I & Sugar Manufacturing-I
DSC STP2	Applied Physics I & II	DSC STP4	Applied Maths I & II

DSC ST:- Discipline Specific Core Course Sugar Technology

AECC:- Ability Enhancement Compulsory Course: Compulsory English

II)B.Sc. Part 2 (Sem III & IV)

Course code	Name of Course	Course code	Name of Course
Sem III		**Sem IV**	
DSC ST17	Sugar Engineering-(Mill House)	**DSC ST23**	Chemical Engineering-(Heat & Moment Transfer)
DSC ST18	Sugar Engineering-(Boiler & Turbine)	**DSC ST24**	Chemical Engineering-(Unit Operation)
DSC ST19	Sugar manufacturing: II (crystallization)	**DSC ST25**	Capacity Calculation-(Clarification)
DSC ST20	Sugar Manufacturing: II (Centrifugal)	**DSC ST26**	Capacity Calculation-(Evaporation & Crystallization)
DSC ST21	Equipment Design-(Clarification)	**DSC ST27**	Chemical Control-(Mill House)
DSC ST22	Equipment Design-(Evaporation & Crystallization)	**DSC ST28**	Chemical Control-(Boiling House)
AECC – C	Environmental Studies (Theory)	**AECC – D**	Environmental Studies (Project)

AECC-C :- Ability Enhancement Compulsory Course: Environmental Studies

Practical

DSC STP5	Sugar manufacturing	**DSC STP7**	Chemical control
DSC STP6	Sugar Engineering		

ii)   B. Sc. Part 3 (Sem V & VI)

Discipline Specific Elective (DSE)

Course code	Name of Course	Course code	Name of Course
Sem V		Sem VI	
DSE ST29	Process Instrumentation & Control: I	DSE ST33	Process Instrumentation & Control :II
DSE ST30	Advanced Sugar Technology	DSE ST34	Advanced Sugar Engineering
DSE ST31	Allied Sugar Manufacturing	DSE ST35	Allied Co Product Manufacturing
DSE ST32	E1:Alcohol Technology: I, E2:Water Management in Cogen: I, E3:Buisness Management and Marketing: I	DSE ST36	F1:Alcohol Technology: II, F2:Water Management in Cogen: II, F3:Buisness Management and Marketing: II
AECC – E	English – III	AECC – F	English – IV

Practical

DSC STP8	In plant Training & Viva (Project Report)
DSC STP9	Technical Essay (Self Study)

DSC:ST1: Applied Chemistry – I (Sugar chemistry)

Credit:01 **[15]**

- Introduction – Etymology, History: accent time, middle age & modern. Chemistry of sugar, Constituents of sugar, Natural polymers of sugars, Flammability of sugar. Types of sugar, Monosaccharide's – Glucose, Fructose, Disaccharides –sucrose .lactose. &maltose
- Forms of sugar and its use .Health effects of sugar- Blood glucose level - Obesity and Diabetics, Cardiovascular disease- Alzheimer's disease Tooth decays - Addiction forming Hyper activity- Measurement
- 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
- Di & Polysaccharides: Structures and properties of sucrose, Maltose, Lactose, Starch & Cellulose (chain structures)

Credit :02 **[15]**

- Physical & Chemical properties of sugar**.**
- Physical properties of sucrose-structure of sucrose molecule .sucrose derivative, decomposition of sucrose.
- 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 reducing sugar :– Physical properties of reducing sugar(dextrose &laevulose) solubility, density, refractive index, optical rotation
- Chemical properties of reducing sugar(dextrose & laevulose) with organic reagent: Acetone, benzoic, carbonate, acetate.
- Chemical properties of reducing sugar(dextrose & laevulose) With inorganic reagent:– Phosphate sodium, chloride salt, calcium levitate.
- Decomposition reaction with alkaline, solution & acid solution, oscillation reaction with iodine.

DSC:ST2: Applied Chemistry – I (Bio chemistry)

Credit :01   **[15]**

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

Credit:02   **[15]**

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

Reference Books :

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

DSC ST3   Applied Physics-I
(Properties of Material & Thermodynamics)

Credit :01   **(15)**

➢ **Surface tension** 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.

➢ **Fluid Dynamics & Viscosity**

General concept of fluid flow, streamline and turbulent flow, the equation of continuity, Bernoulli's 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.

Credit:02   **[15]**

➢ **Kinetic Theory of Gases**

Molecule confirm 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.

➢ **Thermodynamics**

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.

DSC ST4   Applied Physics-I
(Optics & Crystallography)

Credit:01 [15]

> **Diffraction**

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

> **Polarization**

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 – lens of rotation of place of polarization, half shade polarimeter.

Credit :02 [15]

> **Laser and Optical fibers**

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 fiber, properties of fiber, fiber optic communication system, sensors.

> **Crystallography**

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)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 & Subramananyam, S.Chand & Co.Ltd
7) Geometrical & Physical optics : D.S.Mathur
8)Textbook of optics (New Edition) : Brijlal & Subramananyam
9)Fundamentals of optics : Jenkins & White
10) Optics (Second Edition) : Ajay Ghatak

DSC:ST5Applied Maths: I
(Algebra and Geometry)

Credit :01   **[15]**

➢ **General equation Theory**

General equation of place, 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 Inter section of line & plane line
passing through a point at perpendicular to given plane. Intersection of two lines,
image of a point in a plane.

➢ **Trigonometric ratios.**

Trigonometric ratios of some standard angles. Trigonometric identities &
their derivations.

Credit:02   **[15]**

➢ **Determinants and matrices**

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.

➢ **Function**

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

DSC:ST6   Applied Maths: I
(Differential and Integration Calculus)

Credit:01   **[15]**
  ➢ **Derivative of a function.**
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.
  ➢ **Integration**
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.

Credit :02   **[15]**
  ➢ **Differential equations**
Variable separable form, homogeneous & non- homogeneous differential equations. Exact differential equation, linear differential equation of first order. Bernoulli form of differential
equation.
  ➢ **Application of Differential equations**
Law of growth & decay, Newton's law of cooling, orthogonal trajectories of curves, Chemical reactions & solutions. Conduction of heat.

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.
6) Ordinary & Partial Differential Equations : M.D.Raisinghania Analytical, S.Chand & company, New Delhi.
7) Differential Equations : H.V.Kumbhojkar, Nirali Prakashan.
8)Differential Equations : Agashe
9)Integral Calculus : Shantinarayan, S.Chand & company, New Delhi.
10)A text book of Engineering Mathematics: N.P.Bali, Manish Goyal, Laxmi publication

DSC:ST7 Sugar Cane Agriculture:
(Sugar cane cultivation & agronomy)

Credit:01 [15]

Introduction: Origen of Cane, cultivation in India, varieties**,** climatic conditions, sugarcane agro climatic zones in India. Maharashtra state statistics of cane.   Sugar cane pricing and payment,, cane as bio- fuel. Internal and external morphology of cane

Cultivation practices.

Soil: Types, properties – Visual & morphological properties, analytical properties, fertility & soil problems, sustaining fertility, soil conservation practices,

Planting: Preparatory tillage, planting time, selection of seed cane, methods of planting -

Flat, ridges & furrows, trench, IISR 86206, ring, spaced Trans planting & polybag seedling

 Weeds: common weeds, aquatic weeds ,loss due to weeds , method to weed control (mechanical, manual &biological) integrated weed management. Measure to reduced weed.

Growth of Sugarcane: Germination, development of shoot & root - factors affecting,

Tillering, growth of leaves, internodes & stem, factors influencing cane growth, formation

and storage of sugar in cane.

Credit:02

Agronomy [15]

Irrigation: Water requirement, scheduling, method of irrigation – surface, overhead or

sprinkler, drip irrigation, water quality, water logging, drainage – side, main & infield drains.

Manuring: Cane nutrition, functions of macro & micro (trace) nutrients, fertilizers – N,

P, K, S, Ca & Mg carriers, Mixed or compound fertilizers, biofertlizers, foliar applications,

fertigation, organic & green manuring, time & method of application, visual symptoms of

nutrient deficiencies and disorders.

Ripening: Methods of judging ripeness or maturity, factors affecting ripening, accelerating ripening, chemical ripeness.

Harvesting: Manual & mechanical harvesting of cane, transportation of cane, post harvest deterioration of sugarcane – causes, effect & losses, effect of extraneous

Ratooning: Definition, yield & quality, number of ratoons, advantages and disadvantages, area and productivity, causes for low ratooning, tillering, verities for good ratoons, removal of compaction, gap filling, fertilizer application, water requirement

DSC:ST8 Sugar Cane Agriculture:
(Sugar cane Pathology)

Credit:01   Breeding ,physiology &pathology of sugar cane   [15]

Breeding technique in sugarcane, 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,Breeding Methods Introduction and germ plasma collection, Clonal Selection, Hybridization. Mutation breeding Objectives of sugarcane breeding, Breeding for yield, lodging resistance, resistance to frost, resistance to drought, resistance to water logging, resistance to diseases, resistance to insect pests and quality, Sugarcane breeding institutes in India.

Credit :02 Physiology of sugar cane under normal condition   [15]

Physiology of sugar cane under normal saline condition

Rapid screening parameters for salt stress,

Agro-technology to improve germination under saline condition, Work on the physiology on various sugar cane clones.

Sugar cane Pathology

Pests: Leaf eating & sucking insects**,** stalk attacking insects, root attacking insects, soil insects & Non insect species.

Diseases: Major diseases (red rot, smut, pineapple, mosaic, wilt etc), period of occurrence, control measures (chemical & biological), losses due to pests & diseases, plant protection measures.

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. Mehrota

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. Chandaniwala.

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.

AECC:DSC:A English

Subject : English – I (Compulsory)
English for Communication
Credit I :- Communication Skills [15]
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
Credit II : Reading Comprehension Skill [15]
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

Credit :01 Sugar and polysaccharides.   **[15]**
- Introduction to Di and Polysaccharides
- Stereochemistry and cyclic forms
- Sugar derivatives
- Glycoside bonds & cyclic forms
- Polysaccharides – amylase amyl pectin & cellulose
- Glycosaminoglycans and proteoglycans
- Oligosaccharides of glycoproteins and glycolipids
- Lectins

Classification of carbohydrates and Fermentation
a) Monosaccharides – classification of Monosaccharides
- Ring straight chain isomerism
- Use of monosaccharide in living organisms
b) Disaccharides –
- Introduction – nutrition – classification - Metabolism
Catabolism – carbohydrates – chemistry
c) Fermentation – Introduction, Definition, Examples, chemistry, ethanol, fermentation, Lactic acid fermentation, Heterolactic fermentation, Methane gas production in fermentation

Credit :02   **[15]**
Organic acids & Polyphones
• Organic acids & Polyphones in cane juice & their characters.
• Organic acids & their effects on the processing of sugar house products.
• Polyphones and their effects on the processing of sugar house products.
Non sugars in sugar cane juice
• Acids in cane juice-aconite acid, mallic acid, oxalic acid, citric acid,
• Amino acids & proteins in cane juice
• Organic non sugar of high molecular weight in cane juice- cellulose, hemicelluloses, lignin, pectin, starch.
• Colored non sugar originally present in cane juice : chlorophy11, xanthophy11, carotene, anthocyanin. Colored non sugar from sugar decomposition product –
a) caramel b) sugar decomposition product c) inversion of sucrose.

DSC:ST10 Applied Chemistry: II
(Physical Chemistry)

Credit :01 Solution & Strength of Solution [15]
• Definitions of the terms : Soltue, solvent, solution & dilute solution.
• Concentration units : Normality, Molarity,molality, mole fraction, weight reaction, percentage composition by weight ant volume.
• Concentrations of bulk solutions used in laboratory and preparation of standard solutions from them (HC1, H2SO4, HNO3 & ammonia),Numerical problems.

Chemical Kinetics :
• Introduction : Rate of reaction, definition and units of rate constants, factors affection the rate of reaction, order and
molecularity of reaction.
• First order reaction: Rate expression (Derivation not expected), characteristics of first order reaction.
• Pscudounimolecular reactions such as
a) Hydrolysis of methy1 acetate in presence of acid.
b) Decomposition of hydrogen peroxide (KMnO4 method)
• Second order reaction: Derivation of rat constants for equal & unequal concentrations of the reactants. Characteristics of second order reaction.
Ex- a) Specification of ethy1 acetate.
b) Reaction between K2S2o8 & KI
• Chemical kinetics with respective sucrose solution, effect of temp, pH retention time, sucrose inversion, destruction of reducing sugar.
• Numerical problems.

Credit:02 Distribution Law [15]
• 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.

Colloidal State:
• 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-filteration.
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.

Analytical chemistry and Chromatography
• Basic concept , errors , types of errors , accuracy, precision, statistical representation of analytical data.
• 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, stationery phases, supports used in making GLC columns.

Reference Books:
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 inorganic chemistry : Peter Sykes
8)Stereochemistry of organic compounds: Kalsi
9)Stereochemistry of Carbon compounds: Eliel
10) Text book of organic chemistry : P.L.Soni

DSC:ST11 Applied Physics: II
(Basic Instrumentation)

Credit :01   Introduction to Instrumentation   [15]

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.

Transducers

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

Credit:02 Liquid and Temperature Measurement   [15]

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.

Pressure and flow Measurement

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, pitot tube, venturimeter variable area flow meter, rotameter, magnetic flow meter, mass flow meter.

DSC:ST12 Applied Physics: II
(Sugar Instrumentation)

Credit:01 Signal Conditioner [15]

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

Spectrophotometer

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

Credit:02 Flame Photometer [15]

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

Polarimetry

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

PH & Conductivity measurements

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

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

DSC:ST13 Applied Stats: II
(Descriptive statistics)

Credit:01 Introduction: **[15]**
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.

Measures of central tendency and dispersion :
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.

Credit :02 Moments and Measures of Skewness and Kurtosis   **[15**
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, platyokurtic and mesokurtic distributions.Measures of kurtosis based on moments.

Correlation and regression (for ungrouped data)
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.

DSC:ST14 Applied Stats: II

(Probability Theory)

Credit:01 Probability [15]

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.

Conditional probability & independence of events:

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)

Credit:02 Univariate probability distributions [15]

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.

Some standard discrete probability distributions.

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) Goon A.M., Gupta M.K., and Dasgupta B.: Fundamentals of Statistics Vol. I and II, World Press, Calcutta.

4) Gupta S. P. (2002): Statistical Methods, Sultan Chand and Sons, New Delhi.

5) Hogg R. V. and Crag R. G.: Introduction to Mathematical Statistics Ed.4.

6) Hoel P. G. (1971): Introduction to Mathematical Statistics, Asia Publishing House.

DSC:ST15 Sugar Manufacturing: I
(Clarification)

Credit:01   **[15]**

Brief account of sugar industry &sugar manufacturing process. Composition of cane &juice. Measuring &weighing of juice. Equipment detail and operation of Maxwell Boulogne scale, magnetic flow meter. Fine bagasse separation and their effect on clarification.

Basic chemical required for clarification, their specification. Equipments detail &operation of Milk of lime preparation unit, so2 gas production furnace (continuous & film type). Roll of phosphate on clarification &their dose.

Credit:02   **[15]**

Importance of juice heating. Construction and operation of conventional vertical tubular juice heater. Principle of juice clarification. Details of sulphitation &carbonation process. Equipment detail and operation of reaction tank.

Principle of settling. Factors affecting settling. Speed of settling. Equipment construction and operation of Dorr multifeed, Rapi 444. Preparation of settling aid and their dose, Juice and mud removal, preservation of juice during shut down

Object of filtration. Preparation of mud. Mud –mixer &Bagacillo cyclone. Construction and working of vacuum filter.Mini condenser or vacuum pump. Washing of cake. Extraction of light and heavy filtrate

DSC:ST16 Sugar Manufacturing: I
(Evaporation)

Credit:01 [15]

Theory of evaporation-Introduction, quantity of water evaporated from juice, Heat transfer in evaporator, Boiling point of juice, Norbert Rilleux principle applicable to multiple effect evaporators

Construction of Robert type evaporator. Entrainment and entrainment separator. Condenser and type of condenser. Quantity of water required for condention. Vapor velocity and vapor piping. Other type of evaporator.

Operation of evaporator. Off season testing of evaporator. Starting of evaporator. Juice level in evaporator. Condensate and non-condensable gas removal. Flash recovery of condensate. Use Of condensate. Stopping of evaporator.

Credit:02 [15]

Vapor bleeding and steam economy. Basic requirement of steam. Steam economy when vapor used for juice heating. Steam economy when vapor used for juice heating and pan boiling. Steam saving device.

Treatment of syrup. Construction and working of syrup sulphitor. Scale formation and removal.

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

AECC:B English II

Subject : English –II (Compulsory)
English for Communication
Credit I :- Communication Skills [15]
Unit 1 : Telephonic and E-mail communication.
Unit 2 : Making Notes.
Unit 3 : Information Transfer.
Credit II :- Reading Comprehension Skill [15]
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
Unit 8: Argument with God -Y. S. Chemba

Practicals:
DSC:STP1 Applied Chemistry: I
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)
DSC:STP1:Applied Chemistry: II
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.

DSC:STP2 Sugar Cane Agriculture
Study of 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 varieties of sugarcane with special reference to morphology, sugar percentage, yield. (Any four varieties available in the area)

DSC:STP2:Applied Physics I & II

      Tutorials and Assignments

DSC:STP3: Sugar Manufacturing-I

i) To determine the Brix of the given sample by Bx Hydrometer &
Hand refractometer
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 Massecuite
v) To determine the Pol % and Moist % of the Bagasse
vi) To determine the Pol % and Moist % of the Fillter cake
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
(for reducing sugar any one method out of four)

DSC:STP4:Applied Maths I & II

      Tutorials and Assignments