



SHIVAJI UNIVERSITY, KOLHAPUR - 416 004,  
MAHARASHTRA

PHONE : EPABX - 2609000, [www.unishivaji.ac.in](http://www.unishivaji.ac.in), [bos@unishivaji.ac.in](mailto:bos@unishivaji.ac.in)

शिवाजी विद्यापीठ, कोल्हापूर - ४१६ ००४, महाराष्ट्र

दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दूरध्वनी ०२३१-२६०९०९३/९४



SU/BOS/IDS / 207

Date: 06/01/2023

To,

The Principals,

All Concerned Affiliated Colleges / Institutions.

Shivaji University, Kolhapur.

Subject: Regarding syllabi of Diploma in Sugar Technology Part – I under the  
Faculty of Inter- Disciplinary Studies.

Sir/Madam,

With reference to the subject, mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi of Diploma in Sugar Technology Part – I under the Faculty of Inter-Disciplinary Studies.

This syllabi and equivalence shall be implemented from the academic year 2022-2023 onwards. A soft copy containing the syllabi is attached herewith and it is also available on university website [www.unishivaji.ac.in](http://www.unishivaji.ac.in). (Students / Online Syllabus)

The question papers on the pre-revised syllabi of above mentioned course will be set for the examinations to be held in October / November 2022 & March / April 2023. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dy Registrar

Copy to:

|   |  |    |                               |
|---|--|----|-------------------------------|
| 1 | Director Board of Evaluation and Examination | 9  | Centre for Distance Education |
| 2 | The Dean, Faculty of IDS                     | 10 | Computer Centre               |
| 3 | The Chairman, Respective Board of Studies    | 11 | Affiliation Section (U.G.)    |
| 4 | B.A., B.Com., B.Sc. Exam                     | 12 | Affiliation Section (P.G.)    |
| 5 | Eligibility Section                          | 13 | P.G. Admission Section        |
| 6 | O.E. I, II, III, IV Section                  | 14 | Appointment Section           |

SHIVAJI UNIVERSITY, KOLHAPUR



“A<sup>++</sup>” Accredited by NAAC  
(2021) with CGPA 3.52

**Faculty of Interdisciplinary Studies**

**Structure, Scheme and Syllabus for**

**Bachelor of Vocational (B. Voc.)**

**Diploma in Sugar Technology**

**(Subject to the modifications that will be made from  
time to time)**

**Syllabus to be implemented from June 2022-23  
onwards.**

**As Per National Education Policy 2020**

## **1. COURSE INFORMATION**

Ministry of HRD, Government of India has introduced Entrepreneurship oriented Skill development courses of B.Voc./M.voc. courses. These courses will be run by NSQF approved institutes by using available infrastructure and facilities. In these courses, the institute will conduct general education content and sector specific skills will be imparted by Skill Knowledge Providers/ Training Providers/ Industries.

During a year duration of 'Diploma in Sugar Technology', a candidate is trained on professional skill, professional knowledge and Employability skill related to job role. In addition to this a candidate is entrusted to undertake project work, extracurricular activities and on job training to build up confidence. The broad components covered under Professional Skill subject are as below:-

During this Program, the trainee learns about sugar Technology, sugar chemistry, industrial physics, Sugar Agronomy, sugar Manufacturing Processes and byproducts of sugar industry.

## **2. Training scheme**

The (NSQF) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under the aegis of NSQF. Diploma in Sugar Technology with variants and Apprenticeship Training Scheme (ATS) are two pioneer schemes of NSQF for strengthening vocational training.

'Diploma in Sugar Technology' is one of the popular courses delivered nationwide through network of NSQF. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Employability Skills) imparts requisite core skill & knowledge and life skills. After passing out the training program at every level the trainee is awarded by Certificate given by college and university which is recognized worldwide.

### **Candidates require broadly demonstrating that they are competent to:**

1. Read and interpret technical parameters/ documents, plan and organize work processes, identify necessary materials and tools;
2. Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations, Apply professional skill, knowledge & employability skills while performing jobs.
3. Document the technical parameters related to the task undertaken.

### **2.1 Development pathways**

1. Can join as Lab technician, Process in charge, Quality Control officer and quality assurance officer in various sugar industries.
2. Can become Entrepreneur in the related field.
3. Can join Apprenticeship program in different types of industries leading to National Apprenticeship Certificate (NAC).
4. Further Learner Can join Advance diploma, Bachelor degree Master Degree (Vocational) courses under NSQF as applicable.

### 3. LEARNING OUTCOME

Learning outcomes are a expression of total competencies of a learner and assessment will be carried out as per the assessment criteria.

#### LEARNING OUTCOMES (TRADE SPECIFIC)

1. Recognize metrological instruments and the miscellany within the vocation of Sugar Technology subsequent safety precautions.
2. Training the students for advanced methods of cane-sugar production processes related To lab-chemist, supervisor, pan-man, boiler attendants, etc.
3. Training the personnel for production of allied sugar based products like alcohol, Acetone, acetic acid, oxalic acid, etc.
4. Training the personnel for co-generation (power generation) from biomass.
5. Training the personnel to start small scale sugar based industries.
6. Training the personnel for water management and pollution control.

| Award       | Duration after class X II | Corresponding NSQF level |
|-------------|---------------------------|--------------------------|
| Certificate | Sixth month               | 5                        |
| Diploma     | 1 Year                    | 6                        |

#### Course Structure

The course will consist of combination of practice, theory and hands on skills in the sugar Industry.

##### Skill Development Components:

The focus of skill development components shall be to equip students with appropriate knowledge, practice and attitude, to become work ready. The skill development components will be relevant to the sugar industry as per its requirements.

The curriculum will necessarily embed within itself, National Occupational Standards (NOSs) of specific job roles within the Sugar industry. This would enable the students to meet the learning outcomes specified in the NOSs.

The overall design of the skill development component along with the job roles selected will be such that it leads to a comprehensive specialization in few domains.

The curriculum will focus on work-readiness skills in each of the year of training.

Adequate attention will be given in curriculum design to practical work, on the job training, development of student portfolios and project work.

#### A] Ordinance and Regulations: (As applicable to Degree vocational Course)

#### B] Shivaji University, Kolhapur

Syllabus for vocational course in Diploma in Sugar Technology

##### 1. TITLE: Subject- Diploma in Sugar Technology

Under the Faculty of interdisciplinary studies

##### 2. YEAR OF IMPLEMENTATION:- Syllabi will be implemented from June 2020onwards.

### 3. PREAMBLE:-

[Note :-The Adhoc 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. DURATION

B. Voc. - Diploma (One Year)

### 5. STRUCTURE OF COURSE :

Two Semester

One general Papers per year / semester

One elective course paper per semester

Three Core course papers /Vocational Papers per semester

Five Practical papers per semester

One Project / Industry Visit/ Study Tour / Survey/Internship/Hands on training

### 6. SCHEME OF EXAMINATION

**Theory Examination**– Attends of semester as per Shivaji University rules

- i) The examination shall be conducted at the end of each term for semester pattern.
- ii) The Theory paper shall carry 40+10 marks.
- iii) The evaluation of the performance of the students in theory papers shall be on the basis of semester Examination of 40+10marks.
- iv) Question Paper will be set in the view of the /in accordance with the entire Syllabus and preferably covering each Module of syllabi.

**Practical Examination:** Each semester there will be external practical examination attendant of semester.

#### A) THEORY

The theory examination shall be at the end of the each semester. All the general theory papers shall carry 40 marks and all vocational theory papers shall carry 50 marks. Evaluation of the performance of the students in theory shall be on the basis of semester examination as mentioned above. Question paper will be set in the view of entire syllabus preferably covering each Module of the syllabus.

**Nature of question paper for Theory examination** (Excluding Business Communication Paper)–

|   |          |
|---|----------|
| Q.1 Multiple choice                         | 08 marks |
| Q.2 Long answer type (any two) out of three | 16 marks |
| Q.3 Write short notes (any four) out of six | 16 marks |

**B) PRACTICAL** Evaluation of the performance of the students in practical shall be on the basis of semester examination

Each paper having separate practical (EC/CC) 50 marks

**C) Project /field visit/ internship/fieldwork/Hands on training.** 50 marks

#### D) Standard of Passing:

As per the guidelines and rules for B. Voc. (Attached Separately – Annexure I)

**7. FEE STRUCTURE:**

As per Government / University rules.

1. Refer website of concern affiliated college/institute to Shivaji University, Kolhapur.
2. Other fee will be applicable as per rules and norms of UGC and Shivaji University, Kolhapur.

**8. ELIGIBILITY FOR ADMISSION:**

As per guidelines obtained from UGC, NSQF and Shivaji University, Kolhapur by following rules and regarding reservations by Govt. of Maharashtra.

**9. MEDIUM OF INSTRUCTION:**

The medium of instruction shall be in English.

**10. STRUCTURE OF COURSE-** B. voc. Diploma in Sugar Technology**11. Eligibility for Admission** : 10 + 2 from any faculty or equivalent Diploma/Advanced Diploma in any related stream.**12. Eligibility for Faculty** : 1) M. Sc. with NET / SET/ Ph.D.  
2) M.A. (English) with NET/SET for Business Communication**13. Eligibility for Laboratory Assistant cum clerk:** B.Sc. with MSCIT**14. Eligibility for Laboratory attendant:** 10 + 2**15. Staffing Pattern:****Teaching:**

B. Voc. 1 Full Time and 1 Part Time Lecturer and 1 CHB Lecturer for Business communication.

**SHIVAJI UNIVERSITY, KOLHAPUR**  
**STRUCTURE AND SYLLABUS OF B.VOC.**  
**Bachelor of Vocational (B.Voc.) – Diploma in Sugar Technology**

**Semester –I**

**Credits: 30**

| Course no.  | Courses   | Distribution of Marks |              |               | Credits |    |   |       |
|-------------|---|-----------------------|--------------|---------------|---------|----|---|-------|
|             |   | T                     | Intern<br>al | Pract<br>ical | T       | P  | Project/Fiel<br>d visit/<br>Internship/<br>Field work | Total |
| BVDSTCS101  | Business communication-I  | 40                    | 10           |               | 3       |    |   | 3     |
| BVDSTEC102  | General Aspects of Sugar Technology                               | 40                    | 10           | 50            | 3       | 3  |   | 6     |
| BVDSTCC 103 | Sugar Chemistry   | 40                    | 10           | 50            | 3       | 4  |   | 7     |
| BVDSTCC 104 | Industrial Physics  | 40                    | 10           | 50            | 3       | 4  |   | 7     |
| BVDSTCC 105 | Sugarcane Agriculture I   | 40                    | 10           | 50            | 3       | 4  |   | 7     |
|             | Project/Field visit/ Internship/<br>Field work /Hands on training |                       |              |               |         |    |   |       |
| Total       |   | 200                   | 50           | 200           | 15      | 15 |   | 30    |

**Semester II**

**Credits: 30**

| Course no.  | Courses   | Distribution of Marks |              |               | Credits |    |   |       |
|-------------|---|-----------------------|--------------|---------------|---------|----|---|-------|
|             |   | T                     | Intern<br>al | Pract<br>ical | T       | P  | Project/Fiel<br>d visit/<br>Internship/<br>Field work | Total |
| BVDSTCS106  | Business communication-II   | 40                    | 10           |               | 3       |    |   | 3     |
| BVDSTEC107  | Sugar Manufacture I   | 40                    | 10           | 50            | 3       | 3  |   | 6     |
| BVDSTCC 108 | Sugarcane Agriculture II  | 40                    | 10           | 50            | 3       | 4  |   | 7     |
| BVDSTCC 109 | Sugar Manufacture II  | 40                    | 10           | 50            | 3       | 4  |   | 7     |
| BVDSTCC 110 | Skill Based Training  | 40                    | 10           | 50            | 3       | 4  |   | 7     |
|             | Project/Field visit/ Internship/<br>Field work /Hands on training |                       |              |               |         |    |   |       |
| Total       |   | 200                   | 50           | 200           | 15      | 15 |   | 30    |

\*BVDSTCS: Bachelor of Vocational Diploma in Sugar Technology Communication Skill.

\*BVDSTEC: Bachelor of Vocational Diploma in Sugar Technology Elective Course.

\*BVDSTCC: Bachelor of Vocational Diploma in Sugar Technology Core course.

\* T: Theory \* P: Practical

\*\* Non credit courses must be completed as per guidelines of Shivaji University, Kolhapur.

**SHIVAJI UNIVERSITY, KOLHAPUR****Bachelor of Vocational (B.Voc.) – Diploma in Sugar Technology Scheme of Teaching:****B.Voc. - Part I and II Semester****Semester I**

| Course no.   | Courses  | Distribution of Work load (Per Week) |           |
|--------------|--|--------------------------------------|-----------|
|              |  | Theory                               | Practical |
| BVDSTCS101   | Business communication-I                                       | 4                                    | 0         |
| BVDSTEC102   | General Aspects of Sugar Technology                            | 5                                    | 4         |
| BVDSTCC 103  | Sugar Chemistry  | 5                                    | 4         |
| BVDSTCC 104  | Industrial Physics   | 5                                    | 4         |
| BVDSTCC 105  | Sugarcane Agriculture I  | 5                                    | 4         |
|              | Project/Field visit/ Internship/ Field work /Hands on training | -----                                |           |
| <b>Total</b> |  | <b>24</b>                            | <b>16</b> |

**Semester II**

| Course no.   | Courses  | Distribution of Work load(Per Week) |           |
|--------------|--|-------------------------------------|-----------|
|              |  | Theory                              | Practical |
| BVDSTCS106   | Business communication-II                                      | 4                                   | 0         |
| BVDSTEC107   | Sugar Manufacture I  | 5                                   | 4         |
| BVDSTCC 108  | Sugarcane Agriculture II                                       | 5                                   | 4         |
| BVDSTCC 109  | Sugar Manufacture II   | 5                                   | 4         |
| BVDSTCC 110  | Skill Based Training   | 5                                   | 4         |
|              | Project/Field visit/ Internship/ Field work /Hands on training | -----                               |           |
| <b>Total</b> |  | <b>24</b>                           | <b>16</b> |



**SHIVAJI UNIVERSITY, KOLAPUR**

**B. Voc. Part –I**

**Diploma in Sugar Technology**

**Business Communication**

**Course no. BVDSTCS101**

**Total Workload:** 04 lectures per week of 50 mins.

**Distribution of Workload:**

**Theory:** 04 lectures per week

**Credits 3**

**Practical:** 02 lectures per week per batch of 20 students

**Module I: Vocabulary Development and Sentence formation(10)**

**Topics:**

Vocabulary: Affixation

What is a sentence?

Types of sentence: Simple, compound, complex

**Module II: Drafting a Letter of Application and preparing CV/Resume(10)**

**Topics:**

Structure of a letter of application for various posts CV/

Resume and its essentials

**Module III: Presenting Information/ data(10)**

**Topics:**

Presenting information/data using graphics like tables, pie charts, tree

Diagrams, bar diagrams, graphs, flowcharts

**Module IV: Interview Technique (15)**

**Topics:**

Dos and don'ts of an interview

Preparing for an interview

Presenting documents

Language used in an interview

Hypothetical Questions

**Practical: Based on the theory Modules:**

1) Mock interview OR 2) Presentation of Information

**Reference Books:**

Sethi, Anjanee & Bhavana Adhikari. *Business Communication*. New Delhi: Tata McGraw Hill

Tickoo, Champa & Jayab Sasikumar. *Writing with a Purpose*. New York: OUP, 1979.

Sonie, Subhash C. *Mastering the Art of Effective Business Communication*. New Delhi:

Student Aid Publication, 2008.

Herekar, Prakash. *Business Communication*. Pune: Mehta Publications, 2007.

Herekar, Prakash. *Principals of Business Communication*. Pune: Mehta Publications, 2003.

Pradhan, N.S. *Business Communication*. Mumbai: Himalaya Publishing House, 2005.

**SHIVAJI UNIVERSITY, KOLAPUR**

**B. Voc.**

**Diploma in Sugar Technology**

**Semester I**

**General Aspects of Sugar Technology**

**Course no. BVDSTEC102**

**WorkLoad: 8**

**Theory: 4 Lectures/Week**

**Practical: 4 Lectures/Week/Batch**

**Practical: 50Marks**

**Credits 03+03**

**Theory: 40 +10 Marks**

**Objectives:** 1. To facilitate students about Sugar Technology

2. To know the introduction of sugar.

3. To be familiar with the properties of Sugar.

**Course content:**

**Theory-**

**Module 1 Introduction to Sugar Industry (15)**

1.1 Introduction

1.2 Sugar Cane Agriculture

1.3 Availability of Cane

1.4 Utilization of Sugarcane

1.4.1 Granulated Sugar

1.4.2 Brown Sugar

1.4.3 Liquid Sugar

1.4.4 Invert Sugar

1.5 Gur and Gur making

1.6 Khandsari Sugar and its making

1.7 Sugar Cane Development

1.8 Sugar Cane

1.8.1 Constitution of Sugar Cane

1.8.2 Sugarcane Juice

1.9 Cultivation

1.10 Sugar Cane harvesting and Delivery

**Module 2 Introduction to Sugar (15)**

2.1) Introduction – Etymology, History (ancient time & middle age) Modern History

2.2) Chemistry of sugar, Constituents of sugar, Natural polymers of sugars, Flammability of sugar.

2.3) Types of sugar, Monosaccharides – Glucose, Fructose, Disaccharides - Sucrose, maltose, Lactose

2.4) Sources of sugar, Sugar beet, sugarcane

2.5) Refining of sugars

2.6) Sugar production countries

2.7) Forms of sugar and its use Consumption Health effects of sugar-

- 2.7.1) Blood glucose level - Obesity and Diabetes
- 2.7.2) Cardiovascular disease- Alzheimer's disease
- 2.7.3) Tooth decays - Addiction forming
- 2.7.4) Hyper activity- Measurement

### **Module 3 Physical & Chemical properties of sugar. (15)**

- 3.1) 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)
- 3.2) Physical properties of sucrose :- Structure of the sucrose molecule, sucrose derivatives, decomposition of sucrose
- 3.3) 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)
- 3.4) Chemical properties of dextrose & laevulose with organic reagent:- Acetone, benzoic, carbonate, acetate.
- 3.5) Chemical properties of dextrose & laevulose with inorganic reagent:- Phosphate sodium, chloride salt, calcium levulate. Decomposition reaction with alkaline solution & acid solution, oscillation reaction with iodine

#### **Practicals:**

- 1. Measurement of Pol % of sucrose/Molasses on Sucromat.
- 2. Measurement of Pol % of bagasses on sucromat
- 3. Measurement of Pol % of Filtercake on sucromat
- 4. Elemental analysis by flame photometer (Demonstration)
- 5. Determination of PH of Raw juice by PH meter
- 6. Determination of PH of Sulphitation juice by PH meter
- 7. Determination of PH of Syrup by PH meter
- 8. Measure of colour of juice by colorimeter
- 9. Measure of colour of Syrup by colorimeter
- 10. Measure of colour of Sugar by colorimeter
- 11) Measurement of angle of rotation on Automatic polar meter.
- 12) To estimate amount of Cu (II) ions by iodometric titration by using  $\text{Na}_2\text{S}_2\text{O}_3$  solution.
- 13) Quality control-To determine percentage purity of the given sample of soda ash  $\text{Na}_2\text{S}_2\text{O}_3$  by titrimetric method.
- 14) Estimation of amount of Acetic acid from the given vinegar sample by titrimetric method

#### **Reference books:**

- 1. Organic Chemistry: Hendrickson, Cram, Hammond.
- 2. Organic Chemistry: Morrison and 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&ArunBahl.
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: By A. I. Vogel.
12. Advanced Organic Chemistry - Reactions, Mechanism & Structure: JerryMarch.
13. Organic Chemistry: M. R. Jain.
14. Organic Chemistry: J. M. Shaigel.
15. Organic Chemistry: Vol-I, II, and III by S.M. Mukharji, S.P. Singh, R.P. Kapoor (New Age International Pvt. Ltd. Publishers)
16. Organic Chemistry: By Bhupinder Mehta, Manju Mehta (Prentice-Hall of India Pvt. Ltd., New Delhi 110001
17. Text book of organic chemistry: FinarVol I & II
18. Organic Chemistry: Fieser&Fieser
- 19.Mathematical preparation of Physical Chemistry: F. Daniel, Mc-Graw Hill Book company.

**SHIVAJI UNIVERSITY, KOLAPUR**

**B. Voc.**

**Diploma in Sugar Technology**

**Semester I**

**Sugar Chemistry**

**Course no. BVDSTCC103**

**WorkLoad-9**

**Theory:4 Lectures/Week**

**Practical:5 Lectures/Week/Batch**

**Credits: 3+4**

**Theory: 40+10 Marks**

**Practical: 50 Marks**

**Objectives:** To enable students –

- i) To understand Stereochemistry.
- ii) To know the preparation of various Solution.
- iii) To study the Carbohydrates and polysaccharides.

**Module – 1 Stereochemistry of organic compounds: [10]**

- 1.1 Stereoisomerism – Introduction.
- 1.2 Optical isomerism –Introduction.
- 1.3 Elements of symmetry.
- 1.4 Chiral centre. (Explanation with lactic acid.)
- 1.5 Optical isomerism in tartaric acid and 2,3 dihydroxybutanoic acid.
- 1.6 Enantiomers and diastereoisomers.
- 1.7 Racemic modifications.
- 1.8 Geometrical isomerism – Cause of geometrical isomerism.
- 1.9 Geometrical isomerism with respect to  $>C = C<$ ,  $-C = N -$  and  $-N = N$  compounds( Introduction). Geometrical isomerism in maleic and fumaric acids.

**Module – 2 : Carbohydrates [10]**

- 2.1 – Introduction and Classification of Carbohydrates with suitable examples
- 2.2 Reactions of Monosaccharide such as
  - 2.2.1) Mutarotation
  - 2.2.2) Alkaline degradation
  - 2.2.3) Rearrangements
  - 2.2.4) Acidic degradation
  - 2.2.5) Polymetrisation

**Module – 3 : Di and Polysaccharides [08]**

- 3.1 Structures and properties of sucrose, Maltose, Lactose, Starch and Cellulose (Chain structures)

**Module – 4 : Organic acids and Polyphenols [08]**

- 4.1 Organic acids and their effects on the processing of sugar house products
- 4.2 Polyphenols : Occurrence, Classification and their effects on processing of sugar house products

## **Module – 5: Solution and strength of solution [09]**

5.1 Definitions of the terms: Solute, solvent, solution and dilute solution.

5.2 Concentration Modules: Normality, Molarity, Molality, Mole fraction, Weight reaction, Percentage composition by weight and volume.

5.3 Concentrations of Bulk Solutions used in Laboratory and preparation of standard solutions from them (HCl, H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub> and Ammonia)

5.4 Numerical Problems.

### **Practicals :**

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

b. Use S.I. Modules wherever necessary.

1. Determination of purity of phosphoric acid by Sodium hydroxide method
2. Determination of purity of phosphoric acid by Phosphomolybdate method.
3. Determination of purity of hydrogen peroxide
4. Determination of purity of washing soda
5. Determination of purity of formine
6. Determination of purity of caustic soda
7. Determination of CaO content in lime by using pattern and Redder indicator.
8. To determine CaO content in given sample by EDTA Method
9. To determine CaO content in given sample by Ammonium Oxalate Method
10. Determination of content of mill sanitation chemical-Quaternary ammonium compounds
11. Determination of content of mill sanitation chemical –Dithiocarbamate
12. To determine the phosphate contain in the given sample by Uranium Acetate Method
13. Determination of percentage of hydrochloric acid in commercial hydrochloric Acid.
14. Analysis of amino acids from the given sample with TLC.
15. Estimation of amino acids from sugar solution or sugarcane juice spectrophotometrically.
16. Determination of polyphenols spectrophotometrically.
17. Determination of heat of ionization of weak acid by using polythene bottle.
18. Determination of heat capacity of calorimeter for different volumes.
19. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.

### **Reference books:**

1. Biochemistry – Lininger
2. Biochemistry – West and Todd
3. Organic Chemistry: Hendrickson, Cram, Hammond.
4. Organic Chemistry: Morrison and Boyd.
5. Organic Chemistry: Volume I & II. I. L. Finar.
6. Organic Chemistry: Pine
7. Advanced Organic Chemistry: Sachin Kumar Ghosh.
8. Advanced Organic Chemistry: B. S. Bahl & Arun Bahl.
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13. Practical Organic Chemistry : By A. I. Vogel.
14. Advanced Organic Chemistry - Reactions, Mechanism & Structure : Jerry March.
15. Organic Chemistry : M. R. Jain.
16. Organic Chemistry : J. M. Shaigal

**SHIVAJI UNIVERSITY, KOLAPUR**

**B. Voc.**

**Diploma in Sugar Technology**

**Semester I**

**Industrial Physics**

**Course no. BVDSTCC104**

**WorkLoad-9**

**Theory:4 Lectures/Week**

**Practical:Lectures/Week/Batch**

**Objectives:** To enable students –

- i) To understand term used in analytical methods.
- ii) To know the various operations carried out in Polarimetry, Refractometry.
- iii) To study the pH and Conductometry.

**Credits: 3+4**

**Theory: 40+10 Marks**

**Practical: 50Marks**

**Course content:**

**Theory**

**Module – I Introduction to Analytical Methods [10]**

- 1.1) Basic concept,
- 1.2) errors,
- 1.3) types of errors,
- 1.4) accuracy,
- 1.5) precision,
- 1.6) statistical representation of analytical data.

**Module-II :Polarimetry: (10)**

- 2.1) Introduction, plane polarized light, optical activity,
- 2.2) Instrumentation of Polarimeter,
- 2.3) types of polarimeter, Laurentz polarimeter, Industrial polarimeter, white lamp single wedge and double wedge polarimeter, automatic polarimeter,
- 2.4) measurement of specific rotation and determination of unknown concentration and other applications in sugar technology.

**Module-III :Refractometry: (10)**

- 3.1) Introduction,
- 3.2) Snell's law, specific refraction, molar refraction, Hand Refractometer,
- 3.3) Abbe's Refractometer,
- 3.4) experimental techniques and applications.

**Module-IV: pH and Conductivity measurements: (15)**

- 4.1) pH meter, standardization and pH measurements,
- 4.2) conductivity solutions, specific and equivalent conductivity, equivalent conductivity at infinite dilution, measurement of conductivity/resistivity of solution,
- 4.3) Conductometers, wheatstones bridge circuit, conductivity cell applications.
- 4.4) Numerical problems

**Practicals :**

- 1) To find the Recovery of Sugar in Juice by Polari meter.
- 2) To find Purity of Sugar by Polarimeter.
- 3) To find purity of massecuite by Polarimeter.
- 4) To Find the Viscosity of Juice by Viscometer.
- 5) To Find the Viscosity of Syrup by Viscometer.
- 6) To Find the Viscosity of Massecuite by Viscometer.
- 7) To Study the handling of spectrophotometer.
- 8) To determine the refractive index of Juice/sugar Solution by using Abbe's refractometer.
- 9) To study the different types of Transducers and Sensors
- 10) To study the Refractometer instruments.
- 11) To study the Venturimeter.
- 12) To Study the Temperature measurement using Thermocouple.
- 13) To study the measurement of Pressure.
- 14) To study the Float type liquid level measurement

**Reference books:**

1. Instrument engineers handbook – Process measurement by BG Liptak
2. Instrumental methods of analysis by – Wilard , Merrit & Dean
3. Basic concepts of analytical chemistry – S.M. Khopkar
4. Instrumental methods of chemical analysis – G.W. Ewing
5. A quantitative Inorganic analysis – A. I. Vogel
6. Instrumental Methods of analysis – Willand, Merrit & Olean
7. Vogel's Textbook of quantitative Inorganic analysis revised by J. Bassett et al.
8. Instrumental Methods of Chemical Analysis by H. Kaur.
9. Instrumental methods of analysis by Strobel.
10. Practical Physical Chemistry by Findley
11. Instrumental methods of chemical analysis by Bhal and Tuli



**SHIVAJI UNIVERSITY, KOLAPUR**

**B. Voc.**

**Diploma in Sugar Technology**

**Semester I**

**Sugarcane Agriculture I**

**Course no. BVDSTCC105**

**WorkLoad-9**

**Theory:4 Lectures/Week**

**Practical:4 Lectures/Week/Batch**

**Objectives:** To enable students –

- i) To understand Sugarcane
- ii) To study the Sugarcane cultivation practices
- iii) To know the Agronomy and pathology of Sugarcane.

**Credits: 3+4**

**Theory:40+10Marks**

**Practical: 50Marks**

**Course content:**

**Theory**

**Module –1: Introduction, Origin, Distribution and Botany of Sugarcane (10)**

- 1.1. Common name, English name, Botanical name, Classification upto genus.
- 1.2. Centers of sugarcane origin.
- 1.3. Distribution- Indian sugar industry on global screen, Sugarcane area, production and productivity in India.
- 1.4. External morphology
- 1.5. Internal morphology- root, stem and leaves.

**Module-2: Sugarcane cultivation practices (10)**

- 2.1. Soil and sugarcane nutrition
- 2.2. Climatic conditions for sugarcane
- 2.3. Cultivation practices- Preparation of soil, Sugarcane planting methods: Planting in flat beds, ridges and furrows method, pit planting, bud transplanting, Weeds and their control (Chemical and Biological control methods)

**Module-3: Agronomy (10)**

- 3.1. Manuring (Response of sugarcane crop to FYM and Chemical fertilizers, micronutrient), soil application and foliar application.
- 3.2. Irrigation and its methods- Furrow and drip method.
- 3.3. Sugarcane maturity, ripening, harvesting and ratoon management.

**Module-4: Sugarcane pathology (15)**

- 4.1. Diseases of sugarcane with special reference to causal organism, symptoms and its control measures: a) Fungal: Rust of Sugarcane, Whip smut. b) Bacterial: red strips. c) Viral and Mycoplasmal: Mosaic and Grassy shoot.
- 4.2. Pests of sugarcane with special reference to morphology, symptoms and its control measures:
  - a) Termites, b) Shoot borer, c) White flies

**Practicals :**

- 1) Study of external morphology of sugarcane plant.
- 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)

**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.

**SHIVAJI UNIVERSITY, KOLAPUR**

**B. Voc.**

**Diploma in Sugar Technology**

**Business Communication-II**

**Course no. BVDSTCS106**

**Semester-II**

**Distribution of Workload:**

**Credits 3**

Theory: 04 lectures per week

Practical: 02 lectures per week per batch of 20 students

**Modules Prescribed for Theory:**

**Module I: Group Discussion**

**10**

**Topics:**

Dos and Don'ts

Preparing for a Group Discussion

Initiating a Discussion, Eliciting Opinions, Views, etc.

Expressing Agreement/Disagreement

Making Suggestions; Accepting and Denying Suggestions

Summing up.

**Module II: Business Correspondence**

**10**

**Topics:**

Drafting Memos

Writing formal and informal e-mails

Writing letter of inquiry and complaints

Letter of Placing Orders and Tenders.

**Module III: English for Negotiation**

**10**

**Topics:**

Business Negotiations

What is business negotiation?

Agenda for Negotiation

Stages of Negotiation

**Module IV: English for Marketing**

**15**

**Topics:**

Describing/Explaining a Product/Service

Promotion of a Product

Dealing/ bargaining with Customers

Marketing a Product/Service: Use of Pamphlets, Hoardings, Advertisement

**Practical: Based on the theory Modules:**

**I.** Group discussion on various topics or **II.** Preparing advertisement copy for the promotion of a product

**ReferenceBooks:**

Herekar, Praksh. *Business Communication*. Pune: Mehta Publications, 2007.

Herekar, Praksh. *Principals of Business Communication*. Pune: Mehta Publications, 2003

John, David. *Group Discussions*. New Delhi: Arihant Publications.

Pradhan, N. S. *Business Communication*. Mumbai: Himalaya Publishing House, 2005

Rai, Urmila & S. M. Rai. *Business Communication*. Mumbai: Himalaya Publishing House, 2007.

Whitehead, Jeoffrey & David H. Whitehead. *Business Correspondence*.

Allahabad: Wheeler Publishing, 1996.

**SHIVAJI UNIVERSITY, KOLAPUR**

**B. Voc.**

**Diploma in Sugar Technology**

**Semester II**

**Sugar Manufacture I**

**Course no. BVDSTEC107**

**WorkLoad:8**

**Theory: 4 Lectures/Week**

**Practical:4 Lectures/Week/Batch**

**Objectives:** To enable students –

- i) To understand Extraction of Cane Juice
- ii) To study the Cane juice process.
- iii) To know the various processes.

**Credits: 3+3**

**Theory: 40+10Marks**

**Practical: 50Marks**

**Module-I:Extraction[15]**

- 1.1. Extraction of Juice from cane, maceration and imbibitions use of Cold and hot water, maceration schemes and mill sanitation.
- 1.2. Measurement and weightment of juice – Measuring tanks, level Meters, coununters, weighing machines – hand operated, semiautomatic and automatic System – equipment details and operation.
- 1.3. Sulphur burning for production of SO<sub>2</sub> (Sulphur- di-oxide) different types of sulphur Furnaces, batch type, continuous and Acme type-their contruction and operation, gas Scrubbers, cooling of gas, composition of sulphur, different methods of melting and Addition. Air compressors of different types.

**Module – 2 Steam: [10]**

- 2.1. Lime kilns-batch type and continuous type, milk of lime preparation, slacker and grit removal CO<sub>2</sub> scrubbers and cooling of gases.
- 2.2. Juice heaters, plate type heat, exchanges, use of vapors for steam economy.

**Module – 3:Cane Juice [10]**

Composition of cane and juice – their difference, principles of cane juice clarification, influence of lime on the different constituents of juice, effect of pH, effect of heating, different processes of cane juice clarification, simple clarification compound clarification. Process, cold and hot solicitation, continuous solicitation, double solicitation. Carbonation, Single and double, de-Hans' process, comparison of different clarification Modern techniques middle juice carbonation processes etc.

**Module – 4 :Filtration [10]**

- 4.1. Setting tanks, system of draining clear juice and dirty juice, continuous subsidors, door, graver, batch trayless and other types of clarifiers.
- 4.2. Plate and frame type filter presses, continuous filters. leaf filters, oliver filter KCP filters, pressure filters. Sweetenting off different systems.

**Practiacals:**

- 1. Determination of total dissolved solids (Brix) of given sample of juice by Hydrometer and

hand refracto meter.

2. Determination of apparent Purity of given sample of juices.
3. To determine the purity of given sample of syrup and molasses.
4. To determine the purity of given sample of Masseccuite
5. To determine purity of final molasses
6. To determine moist. %of Bagasse.
7. To determine moist. %of filter cake.
8. To determine sucrose of juice by Fehling's method.
9. To determine sucrose of final molasses by 1.double polarization method(Jackson &Gilis)
10. To determine reducing sugar of final molasses by 1. Eyon and lane method 2. Luffs method
- 11 To determine viscosity of final molasses by viscometer.

**Reference books :**

1. Hand book of cane sugar – Meade & Chen
2. Introduction to cane sugar technology – Jenkins G. H.
3. Module 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

**SHIVAJI UNIVERSITY, KOLAPUR**

**B. Voc.**

**Diploma in Sugar Technology**

**Sugarcane Agriculture- II**

**Semester II**

**Course no.BVDSTCC 108**

**WorkLoad-9**

**Theory:4 Lectures/Week**

**Practical: 5 Lectures/Week/Batch**

**Objectives:** To enable students –

- i) To understand Breeding techniques.
- ii) To study the various breeding methods.
- iii) To know the Physiology of sugarcane.

**Credits: 3+4**

**Theory: 40+10Marks**

**Practical: 50Marks**

**Module –1: Breeding techniques in Sugarcane. (10)**

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

**Module-2: Breeding methods. (10)**

- 2.1. Introduction and germ plasma collection.
- 2.2. Clonal selection.
- 2.3. Hybridization.
- 2.4. Mutation breeding.

**Module-3: Objectives of sugarcane breeding (10)**

- 3.1. Breeding for yield, lodging resistance, resistance to frost, resistance to drought, resistance to water logging, resistance to diseases, resistance to insect pests and quality.
- 3.2. Sugarcane breeding institutes in India.

**Module-4. Physiology of sugarcane (15)**

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

**Practicals :**

- 1) Study of sugarcane diseases- red rot, whip smut, leaf scald.
- 2) Study of sugarcane diseases red strips, mosaic and grassy shoot.
- 3) Study of sugarcane pests- termites, shoot borer, white flies.
- 4) Study of different types of fertilizers. (Demonstration)
- 5) Study of different varieties of sugarcane with special reference to morphology, sugar Percentage, yield. (Any four varieties available in the area).

- 6) Study of dimorphic chloroplast (Kranz anatomy) in sugarcane leaves.
- 7) Breeding techniques in sugarcane Occasional Field Work will be arranged to demonstrate various cultivation practices.

**Reference books :**

1. Hand book of cane sugar – Meade & Chen
2. Introduction to cane sugar technology – Jenkins G. H.
3. Module 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



**SHIVAJI UNIVERSITY, KOLAPUR**

**B. Voc.**

**Diploma in Sugar Technology**

**Sugar manufacture II**

**Semester II**

**Course no. BVDSTCC 109**

**WorkLoad-9**

**Theory:4 Lectures/Week**

**Practical:5Lectures/Week/Batch**

**Credits: 3+4**

**Theory: 40+10Marks**

**Practical: 50Marks**

**Objectives:**

- i) To enable students about Evaporators.
- ii) To enable students about Operation in Sugar Manufacture.
- iii) To enable students various treatment in Sugar Manufacturing.

**Module – 1: Evaporators: [10]**

- 1.1 Study of different types of evaporators,
- 1.2 single effect and multiple effect,
- 1.3 vapor cell and preevalaporators,

**Module– 2: Vapor bleeding system: [10]**

- 2.1 Condensers – barometric, multiset, built in condensers,
- 2.2 Catchalls, scale formation and their removal,
- 2.3 factor affecting evaporator performance.

**Module – 3: Operation: [15]**

- 3.1. Operational problems, removal of condensate and non-condensable gases, Brix measuring devices, automatic juice level regulators, rising& falling film evaporator,
- 3.2. Scale removal: soda boiling & descaling procedures followed on general cleaning day.

**Module – 4:Treatment: [10]**

- 4.1 Syrup treatment,
- 4.2 batch and continuous suspiration versels,
- 4.3 Sulphurrring – setting – filtering – pH and brix control of syrup.

**Practicals:**

1. To determine the pH of the given sample by
  - a. Test Paper
  - b. Helige comparator
  - c. pH meter
2. To determine the phosphate contents in the given sample by Spectrophotometer
3. To determine the Reducing sugar by Eyon& lane Method
4. To determine the Reducing sugar by Potassium Ferrocynide Method
5. To determine the Reducing sugar by Luffs Method
6. To determine the Reducing sugar by Colorimetric Method.

**Reference books: Sugar manufacture**

1. Hand of book of cane sugar – Meade & Chen
2. Introduction to cane sugar technology – Jenkins G. H.
3. Module 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

**SHIVAJI UNIVERSITY, KOLAPUR**

**B. Voc.**

**Diploma in Sugar Technology**

**SKILL BASED TRAINING**

**Semester II**

**Course no. BVDSTCC 110**

**WorkLoad-9**

**Theory:4 Lectures/Week**

**Practical: 5Lectures/Week/Batch**

**Objectives:–**

**Credits:3+4**

**Theory: 40+10Marks**

**Practical: 50Marks**

- i) To enable students about Sugar industry.
- ii) To enable students about hands on training
- iii) To know students about Various Processes in sugar industry.
- iv) To know students about sugar Manufacturing.

**INDUSTRIAL TRAINING:**

The purpose of industrial training is to offer wide range of practical exposures to latest practices, equipment and techniques used in the field. This training programme will help the student in acquiring hands on experiences of various practices and events required to perform in different job situations. Through the industrial training, the students are given an opportunity to develop psychomotor skills and problem solving ability.

The industrial Training has the following three components:

1. Orientation Programme
2. Industrial Training in the Industry
3. Report Writing and Evaluation

**Activities to be carried out during training:**

1. Student should visit each section of the industry
2. Observe the processes, tools, machinery and equipment used
3. Observe testing of process at each stage
4. Study drawings and interpreted the drawings
5. Study the organisational structure of the company
6. Study the product development from raw material to finished goods
7. Observe safety norms adopted
8. Prepare a report on a case study, which includes all the components referred above.

**Training Report:**

The students will have to go for industrial training in all the sections of industry. After training, the student is required to prepare a report on the following points:

- Details of the industry
- Layout of the different sections
- List of equipment's in each section
- Organizational structure of the industry
- Description of major processes
- Quality measures adopted in the industry
- Safety norms and there implementation
- One detailed case study.

| <b>Sr. No</b> | <b>Name</b>                  | <b>Designation</b>                         | <b>Signature</b> |
|---------------|------------------------------|--|------------------|
| <b>1</b>      | <b>Dr. Pore S.V.</b>         | <b>Chairman, BOS</b>                       |                  |
| <b>2</b>      | <b>Shri. Kalekar D. G.</b>   | <b>Member and Head, Dept. Of Chemistry</b> |                  |
| <b>3</b>      | <b>Shri. Kharatmol R. M.</b> | <b>Member</b>                              |                  |
| <b>4</b>      | <b>Shri. Bhujabal G. R.</b>  | <b>Member</b>                              |                  |
| <b>5</b>      | <b>Dr. Bhandare S. J.</b>    | <b>I/C Principal</b>                       |                  |