

# राष्ट्रीय शर्करा संस्थान

## कानपुर

# NATIONAL SUGAR INSTITUTE KANPUR

एक आई. एस. ओ. 9001:2015 प्रमाणित संस्थान  
AN ISO 9001:2015 CERTIFIED INSTITUTE



सत्यमेव जयते

## विवरण पुस्तिका

## PROSPECTUS-2026

## **CONTENTS**

<b>Sl. No.</b>	<b>Index</b>	<b>Page No</b>
1.	Historical Background	3
2.	Main Functions of the Institute	3
3.	Advisory Board	4
4.	Teaching staff of the Institute	5
5.	Detail of Courses	7
6.	Tuition and Other Fees	11
7.	Scholarships and Awards	12
8.	Instructions to Candidates and Entrance Exam Schedule	14
9.	Guidelines for Filling the Application Form	15
10.	Important dates & Information for applicant	17
11.	Syllabus for Entrance Examination - A.N.S.I. (Sugar Tech.) Course	18
12.	Syllabus for Entrance Examination - A.N.S.I. (Sugar Engg.) Course	22
13.	Syllabus for Entrance Examination - D.I.F.A.T Course	25
14.	Syllabus for Entrance Examination - D.S.P.M.M. Course	29
15.	Syllabus for Entrance Examination -D.Q.C.E.S. Course	31
16.	Syllabus for Entrance Examination - S.B.C.C Course	34
17.	Syllabus for Entrance Examination - C.C. Q.C. Course	35

# NATIONAL SUGAR INSTITUTE

## KANPUR

### 1. HISTORICAL BACKGROUND

It was the Indian Sugar Committee appointed by Government of India in 1920 that first recommended the establishment of an all India Institute for research in Sugar Technology. The need for a Central Sugar Research Institute was also emphasized by the Royal Commission on Agriculture in 1928 and the Tariff- Board in 1930. The Government of India accordingly established the Imperial Institute of Sugar Technology at Kanpur in October, 1936 by taking over the Sugar Section of Harcourt Butler Technological Institute (H.B.T.I.), Kanpur. The Imperial Institute of Sugar Technology was placed under the administrative control of the Imperial Council of Agricultural Research but continued to be housed in the building of H.B.T.I. With the formation of Indian Central Sugarcane Committee in 1944, the administrative control of the Imperial Institute of Sugar Technology was transferred to that Committee. Consequent on India's attaining independence; the name of the Institute was changed to Indian Institute of Sugar Technology (I.I.S.T.). With the formation of the Development Council for Sugar Industry under the provisions of the Industries (Development and Regulation) Act 1951, the functions of the Indian Central Sugarcane Committee were abridged and with effect from 1<sup>st</sup> January, 1954, the administrative control of the Institute was transferred to the Government of India, under the then Ministry of Food & Agriculture. In April, 1957, the name of the Institute was again changed to National Sugar Institute (N.S.I.). The Institute shifted from H.B.T.I., to its present premises in 1963.

### 2. MAIN FUNCTIONS OF THE INSTITUTE

**The main functions of the Institute are as follows**

- (i) To provide technical education and training in all branches of sugar chemistry, sugar technology, sugar engineering and allied fields
- (ii) To undertake research on
  - a) Problems pertaining to sugar technology, sugar and sugarcane chemistry and sugar engineering in general and those of sugar factories in particular and
  - b) Utilization of by-products of sugar industry and
- (iii) To give technical advice and assistance to sugar factories with a view to improve their efficiency and to assist and guide them in their day-to-day problems. Assistance is also provided to Central and state Governments in matters relating to sugar and allied industries.

All these functions are carried out in an integrated manner, each one helping and influencing the other. The advisory and extension services bring the problems of the industry for research at the Institute. The research requires keeping abreast with modern developments and recent advances in science and technology. The close and continuing liaison between the Institute and the industry and the day-to-day knowledge gained through research give a practical base to the teaching and keep it up-to-date. These three functions- teaching, research and advisory make the Institute a unique one in the world.

### 3. ADVISORY BOARD

The activities of the Institute are guided by an Advisory Board set up by the Ministry of Consumer Affairs, Food & Public Distribution, Department of Food & Public Distribution, and Government of India. The composition of the Board (constituted on 22<sup>nd</sup> August 2024) is as follows

1.	Joint Secretary (Sugar & Movement), Ministry of Consumer Affairs, Food and Public Distribution, Department of Food and Public Distribution, Krishi Bhawan, New Delhi- 110001	Chairman
2.	Director, Directorate of Sugar and Vegetable Oils, Ministry of Consumer Affairs, Food and Public Distribution, Department of Food and Public Distribution, Krishi Bhawan, New Delhi-110001	Member
3.	Professor & Head Department of Sustainable Energy Engineering Indian Institute of Technology, Kalyanpur, Kanpur- 208016	Member
4.	Director Indian Institute of Sugarcane Research Institute, Raebareli Road, PO-Dilkhusha, Lucknow-226002 (U.P.)	Member
5.	President Indian Sugar Mills Association, Ansal Plaza, C-Block, 2 <sup>nd</sup> Floor, August Kranti Marg, Adrewsganj New Delhi- 110049	Member
6.	President, National Federation, of Co-operative Sugar Factories Ltd. Ansal Plaza, Block-C, 2 <sup>nd</sup> Floor, August Kranti Marg, New Delhi-110049	Member
7.	President, All India Distilleries Association, 805, Sidhartha,96, Nehru Place, New Delhi- 110011	Member
8.	Director, Sugarcane Breeding Institute, Coimbatore, Tamilnadu-641007	Member
9.	The Director, National Sugar Institute, Kalyanpur, Kanpur 208017	Member Secretary

The advisory board reviews the progress of work in different fields of activities of the Institute.

#### 4. TEACHING STAFF OF THE INSTITUTE

The teaching staffs of the institute (not in order of seniority) are as under

Dr. (Mrs) Seema Paroha,, M.Sc., Ph.D.		Director
<b>SUGAR TECHNOLOGY</b>		
1.	Shri Mihir Mandal M.Sc., A.N.S.I. (Sugar Technology)	Asst. Prof. of Sugar Technology
2.	Shri Ajay Kumar Awasthi B.Sc., A.N.S.I. (Sugar Technology)	Asst. Prof. of Sugar Technology
3.	Shri Vivek Pratap Singh B.Sc., A.N.S.I. (Sugar Technology), FNSI (ST), MBA	Asst. Prof. of Sugar Technology
4.	Shri Mahendra Kumar Yadav B.Sc., A.N.S.I. (Sugar Technology), F.N.S.I (ST)	Asst. Prof. of Sugar Technology
5.	Shri A.K. Asthana M.Sc., A.N.S.I. (Sugar Technology)	Technical Officer (Sugar Technology)
6.	Shri Ashish Kumar Shukla B.Sc., A.N.S.I. (Sugar Technology), FNSI (ST),MBA	Technical Officer (Sugar Technology)
7.	Shri Subhash Chandra M.Sc., A.N.S.I. (Sugar Technology)	Technical Officer (Sugar Technology)
8.	Shri Prem Shankar Katiyar B.Sc., A.N.S.I. (S.T.) P.G. Diploma in Computer Programming	Technical Officer (Sugar Technology)
9.	Shri Vaibhav Sharma B.Sc., A.N.S.I. (Sugar Technology)	Technical Officer (Sugar Technology)
10.	Shri Mahendra Pratap Singh M.Sc., ANSI (Sugar Technology), FNSI (ST), MBA (HR)	Technical Officer (Sugar Technology)
11.	Shri Amresh Pratap Singh B.Sc., A.N.S.I. (Sugar Technology)	Senior Technical Assistant (Sugar Technology)
12.	Shri Mohit Kumar B.Sc., A.N.S.I. (Sugar Technology)	Senior Technical Assistant (Sugar Technology)
13.	Shri Tej Pal Verma B.Sc., A.N.S.I. (Sugar Technology)	Senior Technical Assistant (Sugar Technology)
14.	Shri Ashish Kumar B.Sc., A.N.S.I. (Sugar Technology)	Senior Technical Assistant (Sugar Technology)
15.	Shri Sharad Babu B.Sc., A.N.S.I. (Sugar Technology)	Senior Technical Assistant (Sugar Technology)
16.	Shri Anurag Verma B.Sc., A.N.S.I. (Sugar Technology)	Technical Assistant (Sugar Technology)

<b>SUGAR ENGINEERING</b>		
1.	Shri Sanjay Chauhan B.Sc. Engg.(Mech.) BOE, ANSI(Sugar Engg)	Assistant Professor of Sugar Engineering
2.	Dr. Vinay Kumar AMIE (Elect. Engg.), M.Tech., Ph.D	Assistant Professor of Sugar Engineering
3.	Shri Anoop Kumar Kanaujia, B.Tech (Elect. Engg.), M.Tech (Elect. Engg.)	Assistant Professor of Sugar Engineering
4.	Shri Kuldeep Singh Rana B.Tech (Mech),M. Tech (Mfg.)	Asstt. Engineer (Elect./Mechanical)
5.	Shri Ho Ram Diploma in Electrical Engineering	Asstt. Engineer (Electrical)
6.	Shri Ashutosh Pratap Singh B.Tech (Mech Engg.) , M.Tech. (Energy Studies)	Senior Research Assistant (Engg.)
7.	Shri Nilesh Kumar Verma Diploma in Mech. Engg.	Research Assistant (Engg.)
8.	Shri. Shivam Awasthi Diploma in Mech. Engg.	Research Assistant (Engg.)
<b>INSTRUMENTATION ENGINEERING</b>		
1	Shri Virendra Kumar B.Tech (Electronics & Instrumentation)	Senior Instrument Engineer
2	Shri Brajesh Singh B.Tech (Applied Electronics & Instrumentation)	Technical Officer (Instrument Engineering)
<b>DESIGN &amp; DEVELOPMENT</b>		
1	Shri Akhilesh Kumar Pandey Intermediate, ITI	Chief Designer
2	Shri Shashi Prakash Yadav Diploma in Mech. Engg.	Senior Draughtsman
3	Shri Ankur Shukla Diploma in Mech. Engg. (CAD)	Senior Draughtsman
4	Shri. Ashutosh Kumar Sharma B.Tech (Mech)	Senior Draughtsman
5	Ms. Anjali Maurya Diploma in Mech. Engg. (CAD)	Draughtsman
<b>ORGANIC CHEMISTRY</b>		
1	Dr. (Mrs.) Chitra Yadav M.Sc., Ph.D.	Research Assistant (Organic Chemistry)
<b>PHYSICAL CHEMISTRY</b>		
1	Dr. Sudhanshu Mohan M.Sc., Ph.D.	Asstt. Prof. of Physical Chemistry
2.	Ms. Sumana Kundu M.Sc. (Chemistry)	Research Assistant (Physical Chemistry)
<b>AGRICULTURE CHEMISTRY</b>		
1	Dr. Ashok Kumar M.Sc. (Ag.), Ph.D. (Soil Science & Ag. Chem.)	Professor of Agriculture Chemistry
2	Dr. Lokesh Babar M.Sc. (Agri. Chem.), Ph.D.(Agri. Chem.)	Asstt. Prof. of Agriculture Chemistry
3.	Shri Abhishek Patel M.Sc (Agriculture Chemistry)	Research Assistant (Agri. Chemistry)
<b>BIOCHEMISTRY</b>		
1	Dr. (Mrs.) Ananthalakshmi Ranganathan M. Sc., M. Phil, Ph. D. (SET)	Assistant Professor of Biochemistry
2	Ms. Shivani Rathi M. Sc (Chemistry)	Research Assistant (Biochemistry)
3	Dr.(Mrs) Alka Gupta M.Sc., Ph.D.	Laboratory Assistant

## 5. DETAIL OF COURSES

The Institute provides facilities for training the students in Sugar Technology, Sugar Engineering, Industrial Fermentation and Alcohol Technology, etc.

### AGE LIMIT for all Courses

**For Indian candidates: 35 years (Maximum) as on 01.07.2026. Candidates born on or after 01.07.1991 only will be considered.**

**For Foreign Category Candidates: 38 years (Maximum) as on 01.07.2026. Candidates born on or after 01.07.1988 only will be considered.**

- **NO AGE LIMIT for those candidates applying for Executive Entry of ANSI (SE)**

**Academic year- From 1st July, 2026 to 31st May, 2027.**

The details of the courses of study are given below

### 5.1 POST GRADUATE DIPLOMA COURSES

Course	Duration	Minimum Qualification		No. of seats									Scope
		Academic (All educational qualifications should be from recognized Institute/ School/ College/ Polytechnic/ University)	Experience	Vertical Reservation					Total	Horizontal Reservation			
				General	Scheduled Castes (15%)	Scheduled Tribes (7.50%)	OBC (27%)	EWS (10%)		Rural (15%)	Defence (5%)	Physically challenged (3%)	
<b>ANSI (ST)</b> Post Graduate Diploma Course of Associateship of National Sugar Institute in Sugar Technology	Two and half academic years	B.Sc. with Chemistry, Physics and Mathematics or Bachelor's Degree in Chemical Engineering or B.Sc. (Sugar Science & Technology) awarded by SNSI, Belgavi or Graduation in Food Technology	---	30	09	05	16	06	<b>66</b>	09	03	02	Diploma holders of this course are usually appointed to the posts of Manufacturing Chemist, Lab Incharge and Assistant Manager (Process) etc. in Sugar and allied Units

<b>ANSI (SE)</b> Post Graduate Diploma Course of Associateship of National Sugar Institute in Sugar Engineering	One and Half academic years	Bachelor's Degree or A.M.I.E.(from The Institutions of Engineers, India) in Mechanical/ Production/ Electrical/ Electrical & Electronic/ Electronics & Instrumentation/ Electronics/ Instrumentation/ Electrical & Electronics/ Applied Electronics& Instrumentation/ Electronics & Communication/ Instrumentation & Control	--- -	25	09	05	17	06	<b>62*</b> (57 + 5)	09	03	02	Diploma holders of this course are usually appointed to the posts of Engineer, Assistant Engineer and Assistant Manager (Engg) etc. in Sugar and allied Industries.
<p>Executive ANSI (SE) – 5 seats –Candidates with 5 years experience after SECC in Sugar Factory will be admitted without entrance exam, Priority will be given based on academic and professional credits.</p> <p>ANSI (SE) – 57 seats – Mechanical Engineering: Electrical Engineering: Instrumentation Engineering = 70:15:15</p>													
<b>DIFAT</b> Post Graduate Diploma Course in Industrial Fermentation and Alcohol Technology	One and Half academic Years	B.Sc. with Chemistry / Applied Chem./ Industrial Chem. or Bio- Chemistry as one of the subject or Graduation in Microbiology/ Biotechnology/ Chemical Engineering or Biochemical Engineering	--- -	19	08	04	14	05	<b>50</b>	08	03	02	Diploma holders of this course are usually appointed to the posts of Distillery Chemist & Supervisory Chemist, etc. in distilleries, breweries & other fermentation Units.
<b>DSPMM</b> Post Graduate Diploma Course in Sugarcane Productivity and Maturity Management	One academic year	B.Sc. Agriculture	--- -	09	03	01	05	02	<b>20</b>	03	01	01	The Diploma holders shall get chance for appointment to the posts of Cane Development Officer, Cane Officer & Cane Supervisor etc. in sugar factories and cane departments
<b>DQCES</b> Post Graduate Diploma Course in Quality Control And Environmental Science	One academic year	B.Sc. with Physics, Chemistry, Maths or Zoology, Botany, Chemistry/ B. Sc. with Environmental Science/ B.Sc. (Bio-Technology)/ B. Tech (Bio-Technology)	--- -	10	03	02	05	02	<b>22</b>	03	01	01	The Diploma holders shall get chance for appointment as Environmental Chemist, Quality Control Chemist and Laboratory Chemist etc. in Sugar Factory and Distilleries.

## 5.2 CERTIFICATE COURSES

<b>SBCC</b> Sugar Boiling Certificate Course	One academic Year	Matriculate/ High School with Science/Agriculture.	One season experience ( min. 90 days) of pan-operation in a vacuum pan sugar Factory along with Nomination Form.	29	09	04	15	06	<b>63</b>	09	03	02	The certificate holders are usually appointed to the posts of Pan man, Head Pan man, and Laboratory Chemist, etc. in sugar factories.
---	-------------------	--	--	----	----	----	----	----	-----------	----	----	----	---

<b>CCQC</b> Certificate Course in Quality Control	Four months (July to October)	10+2/Intermediate in Science	----	12	05	02	08	03	<b>30</b>	05	02	01	The certificate holders are appointed to the posts of Laboratory Chemist, Quality Control Chemist and Laboratory In-charge etc. in sugar and allied Industries.
<b>Total</b>				134	46	23	80	30	<b>313</b>	46	16	11	

### 5.3 Fellowship Diploma of the Institute (F.N.S.I.)

(i) Age limit: - 50 years (Maximum) as on 01.07.2026

(ii) Qualifications for admissions

Diploma	Admission Qualifications
(a) F.N.S.I. in Sugar Technology or Sugar Chemistry	A.N.S.I. (Sugar Tech.)/AVSI (Sugar Tech.)
(b) F.N.S.I. in Sugar Engineering	A.N.S.I. (Sugar Engg.)/AVSI (Sugar Engg.)
(c) F.N.S.I. in Fermentation Technology	D.I.F.A.T./ I.F.A.T. From VSI / M.Sc. (Alcohol Technology)

Application for F.N.S.I. in Sugar Technology & Sugar Engineering should be sponsored by a sugar factory/allied unit for carrying out the research pertaining to this course. Similarly, application for F.N.S.I. in Fermentation Technology should be sponsored by a distillery or brewery industry or allied unit for carrying out the research work pertaining to this course. **Un-sponsored applications would be rejected.**

(iii) Duration of the Course

For (a) & (b) One year or three off-seasons of four months each followed or preceded by practical training for two cane crushing seasons in a sugar factory. The research work may be carried out at the factory/unit under the supervision of guide.

For (c) One year followed or preceded by practical training of one year in a distillery or brewery.

(iv) Rules and regulations for admission to F.N.S.I

1. The fellowship Diploma can be obtained by research work under the guidance of the research staff of the Institute on problems which have bearing on sugar technology, sugar chemistry, sugar engineering and fermentation technology.

2. Intending candidates may be required to appear for an interview before Selection Committee who will satisfy themselves that a particular candidate is fit for admission to this course.

3. After the student has been admitted to this course, he/she will be required to prepare an outline of the problem which he/she proposes to take up for investigation and submit it to the Director for approval.

4. Each student of F.N.S.I. (Sugar Tech, Sugar Chemistry and Sugar Engg.) will be required to work in a sugar factory/allied unit during two cane seasons; in case of F.N.S.I. (Fermentation Technology) student will be required to work in any distillery/ allied unit for one year but no student except a nominee of a factory will be permitted to take up a salaried appointment or engage himself in private practice during the course of study.

5. Each candidate will have to submit three typed copies of his/her thesis embodying the result of his/her investigation not later than 15<sup>th</sup> November or 15<sup>th</sup> May, as the case may be, or any subsequent date which the Director may fix. The thesis will be examined by a Board of Examiners of whom one will be the officer under whom the work has been carried out and the other an external examiner, who will be appointed by the Director. After the evaluation of thesis, the Board of Examiners will conduct a viva-voce examination and make their final recommendation to the Director regarding the award of the Diploma. If a student fails to qualify for the Diploma once, he/she may be allowed to continue his/her work at the Institute for one or more sessions and submit a fresh thesis.

6. The thesis submitted by a candidate will be the property of the Institute and shall not be published without the permission of the Director. Publication of thesis without the permission of the Director will disqualify a student altogether for the Diploma with the same thesis.

7. An assistant working in the Institute is considered to be a student for the award of a fellowship diploma provided he/she is either an associate of the Institute or possesses an equivalent qualification. He/She can after three years of service in the Institute submit a thesis containing his/her research work which shall be considered along with the other candidate admitted to the fellowship course. The work submitted should have been carried out by him/her either independently or under the direction of research officer of the Institute. He/She shall be required to intimate the Director at least six months before the date of submission of thesis. He/She will be required to deposit a fee of Rs. 500.

## 6. TUITION AND OTHER FEES

### 6.1 The following are the tuition fees for the various courses

Sl. No.	Courses	Per month (Rs.) For		
		Other than SC/ST candidates	SC/ST Candidates	Foreign Nationals/ PIO candidates
1.	Fellowship of National Sugar Institute	3100	2200	-----
2.	Post Graduate Diploma Course of Associateship of National Sugar Institute in Sugar Technology	3100	2200	13200
3.	Post Graduate Diploma Course of Associateship of National Sugar Institute in Sugar Engineering	3100	2200	13200
4.	Post Graduate Diploma Course of in Industrial Fermentation and Alcohol Technology	3100	2200	13200
5.	Post Graduate Diploma Course in Sugarcane Productivity and Maturity Management	3100	2200	13200
6.	Post Graduate Diploma Course in Quality Control and Environmental Science	3100	2200	13200
7.	Sugar Boiling Certificate Course	2300	1500	11000
8.	Certificate Course in Quality Control	2300	1500	11000

### 6.2 In addition to the above monthly tuition fees, the students will have to pay, at the time of admission, following fees and deposits as detailed below

S. No.	Item	Fee (Rs.)
1	Caution Money deposit (Refundable)	1500
2	Annual Subscription for Scientific Society	1000
3	Annual Games fees	1000
4	Annual Subscription for Cultural Society	1000
5	Examination Fees- per session for all courses	1000
6	Common Room fees per year(For Diploma Courses)	1500
7	Common Room fees per year(For Certificate Courses)	800
8	Alumni fees	600
9	<b>Hostel fees:</b>	
	a. Hostel Admission fees	500
	b. Room rent per month: For Foreigner	1500
	d. Room rent per month: For Indian	800
	f. Electricity & water charges per month	350
	h. Hostel caution money (Refundable)	1200
	i. Hostel crockery fee per term (half-yearly)	500
	j. Medical fees half-yearly	500
	k. Hostel mess advance per month	5000
	l. Hostel Establishment	
	• ANSI (ST- 1st year) & DSPMM	2500
	• Others	2000
10	Convocation fees	1000
11	Identity Cards Fees	100

#### Note-

1. The students will have to pay fees etc. as given in 6.1 & 6.2 in advance for each year.
2. In case any student discontinues his/her studies after deposition of scheduled fees, only caution money deposit and hostel caution money are refundable.

## 7. SCHOLARSHIPS AND AWARDS

Scholarships and awards are available for different courses of study as listed below:-

### 7.1 For Students of Associateship course in Sugar Technology [A.N.S.I. (S.T.)]

Sl. No	Donor	No of Scholarship /Awards	Value	Basis of award	
				Position	Exam.
1.	Government of India, Ministry of Consumer Affairs, Food & Public Distribution.	1	Rs. 150/- per Month	1 <sup>st</sup> in the order of merit	First year
2.	Government of India, Ministry of Consumer Affairs, Food & Public Distribution.	1	Rs. 100/- per Month	2 <sup>nd</sup> in the order of merit	First year
3.	National Sugar Institute Kanpur	1	Mahatma Gandhi Memorial Gold Medal	1 <sup>st</sup> in the order of merit	Final year
4.	Indian Sugar Mills Association New Delhi.	1	Rs. 7000/- Lump-sum	2 <sup>nd</sup> in the order of merit	First year
5.	Indian Sugar Mills Association New Delhi.	1	Rs. 14000/- Lump-sum	1 <sup>st</sup> in the order of merit	First year
6.	National Federation of Co-operative Sugar Factories New Delhi	1	Rs. 3000/- lump sum	1 <sup>st</sup> in the order of merit	Final year
7.	Late (Shri) S.N. Gundu Rao Memorial Scholarship	1	Rs. 150/- per Month	1 <sup>st</sup> in the order of merit	First year
8.	Late (Dr.) Kripa Shankar Memorial Scholarship	1	Rs. 500/- per Month	Highest marks in Sugar Tech.	First year
9.	Shree Ji Future Leader Award by Shree Ji Process Engg. Works Ltd., Mumbai	1	Rs. 10000/- and Trophy	a. Outstanding academic performance b. Participated Enthusiastically in various extra curriculum activity	First year
10.	ISGEC Sugar Technology Excellency Award by ISGEC Noida	1	Gold Medal	1 <sup>st</sup> in the order of merit	Final year
11.	Shri C.V. Subba Rao Excellence Award	1	Gold Medal & Rs. 10000/-	1 <sup>st</sup> in the order of merit	Final year
12.	Dr. G.D. Nigam Scholarship	1	Rs.- 1000/- per Month	Highest Marks in physical chemistry	First year
13.	Dr. G.D. Nigam Silver Medal Award	1	Rs.- 10000/- Lump-sum	2 <sup>nd</sup> in the order of merit	Final year
14.	Late Padmashri Meenakshi Saraogi Ji	1	Gold Medal & Rs.- 20000/-	1 <sup>st</sup> in the order of merit	Final year

### 7.2 For Students of Associateship Course in Sugar Engineering [A.N.S.I. (S.E.)]

Sl. No	Donor	No of Scholarship /Awards	Value	Basis of award	
				Position	Exam.
1.	Government of India, Ministry of Consumer Affairs, Food & Public Distribution.	4	Rs. 300/- per Month	In the order of merit from the selection test	-
2.	Indian Sugar Mills Association New Delhi.	1	Rs. 11000/- Lump-sum	1 <sup>st</sup> in the order of merit	First year
3.	Indian Sugar Mills Association New Delhi.	1	Rs. 6000/- Lump-sum	2 <sup>nd</sup> in the order of merit	First year

4.	Shree Ji Future Leader Award by Shree Ji Process Engg. Works Ltd., Mumbai	1	Rs. 10000/- and Trophy	a. Outstanding academic performance b. Participated Enthusiastically in various extra curriculum activity	First year
5.	ISGEC Sugar Engineering Excellency Award by ISGEC Noida	1	Gold Medal	1 <sup>st</sup> in the order of merit	Final year

### 7.3 For Students of Diploma in Industrial Fermentation & Alcohol Technology [D.I.F.A.T.]

SL. No	Donor	No of Scholarship /Awards	Value	Basis of award	
				Position	Exam.
1.	Indian Sugar Mills Association New Delhi.	1	Rs. 10000/- Lump-sum	1 <sup>st</sup> in the order of merit	Final Year
2.	Praj Excellence Award by Praj Industries Ltd. Noida	1	Rs. 10000/- Lump-sum	1 <sup>st</sup> in the order of merit	Final Year
3.	ISGEC Alcohol Technology Excellence Award by ISGEC Noida	1	Gold Medal	1 <sup>st</sup> in the order of merit	Final year

### 7.4 For Students of other Courses

1.	Late Smt. Bhagwanta Devi Memorial Scholarship	1	Rs. 6500/- Lump-sum	In the order of merit from selection test	DQCES
2.	Late Smt. Bhagwanta Devi Memorial Scholarship	1		In the order of merit from selection test	DSPMM
3.	Late Smt. Bhagwanta Devi Memorial Scholarship	2		In the order of merit from selection test	SBCC
4.	Late Smt. Bhagwanta Devi Memorial Scholarship	1		In the order of merit from selection test	CCQC
5.	Global Cane Sugar Services Award	1	Rs. 10000/- Lump-sum	1 <sup>st</sup> in the order of merit	CCQC, SBCC & DSPMM
6.	Dr. G.D. Nigam Gold Medal Award	1	Rs. 10000/- cash award	1 <sup>st</sup> in the order of merit	DQCES

### 7.5 General Rules applicable to all Scholarships

1. All scholarships are subject to filling a bond by the candidates so as to ensure that the purpose for which the scholarship is granted is fulfilled, failing which the money received is required to be refunded.
2. The scholarship is paid subject to satisfactory progress having been made and attendance being regular.
3. The scholarship is paid from the date on which the scholar actually joins the institute or from any other subsequent date from which the scholarship is payable after the commencement of the session. It is ordinarily tenable for the full period of the academic session.

- Scholarships are subject to cancellation at any time in the event of any misconduct or irregularity on the part of the scholar.
- If the number of students eligible for a particular category of Scholarship/Award exceeds the available number of Scholarship/Award of that category, the amount of Scholarship/Award will be equally distributed among the students eligible for Scholarship/Award. Those who are already in employment will not be entitled for any scholarship.

## **8 INSTRUCTIONS TO CANDIDATES & ENTRANCE EXAMINATION SCHEDULE**

### **General Instructions**

- All rights for change of rules & regulations, Institute fees including number of seats etc., provided in this prospectus are reserved with the Institute and these can be changed any time without giving any notice or making any correspondence in this regard with anyone. In case of doubts or discrepancy the content of the English version of the prospectus shall be treated as final.
- Before applying for admission, candidates should ensure that they possess the minimum qualifications required for the courses and if they are applying for a particular category they possess the proper certificates for that category complete in every respect as per the desired norms failing which their admission is liable to be cancelled.
- Only one application form will be accepted from an applicant & for one course only.
- Canvassing in any form will disqualify the candidate; hence no recommendations should be forwarded to the Director or any other Officer of the Institute.
- All candidates will have to make their own arrangements of boarding and lodging for onlinetest or interview and no T.A. etc. is admissible.
- Candidates are required to bring all original certificates/degrees /diplomas and testimonials at the time of interview / counseling for admission.
- Hostel is compulsory for students and they will essentially have to reside in hostel. However, in extreme circumstances, relaxation may be provided by the Director.

### **8.1 IMPORTANT INSTRUCTIONS TO FOREIGN CATEGORY CANDIDATES**

- For admission of Foreign Nationals / PIO / Children of Indian workers in the gulf countries, in the A.N.S.I. (S.T.), A.N.S.I. (S.E.) and D.I.F.A.T. courses, 15 % seats shall be allowed on supernumerary basis. Eligibility criterion of age and qualification etc., as specified in the prospectus for various courses shall apply to these candidates also. The knowledge of written and spoken English is a must for foreign candidates.
- Candidates under foreign category quota shall have to submit the application online mode only. The hard copy to be sent to Director, National Sugar Institute, Kanpur.
- The candidate has to submit details of his/her passport (a scanned copy) with the application form. The candidate, if employed, shall submit "No Objection Certificate" from his/her employer for undertaking the studies.
- For Candidates of A.N.S.I. (S.T.), A.N.S.I. (S.E.), D.I.F.A.T., D.S.P.M.M., D.Q.C.E.S., S.B.C.C., & C.C.Q.C. Courses**
  - The candidates who have appeared in the Final examination of minimum prescribed qualification for A.N.S.I.(S.T.), A.N.S.I. (S.E.), D.I.F.A.T., D.S.P.M.M., D.Q.C.E.S., & C.C.Q.C. courses can also apply for admission.

- (ii) However they are required to provide the self-attested copy of the original mark sheet or Internet Mark Sheet duly verified by the University of the Final Examination Result at the time of counseling failing which they will not be admitted and no relaxation is possible to be given on this account. But they are required to submit, self-attested copies of rest of the mark sheets (each year/semester of B.Sc./B.E./ Diploma ) along with application form.
- (iii) The online entrance examination for admission to A.N.S.I. (S.T.), A.N.S.I. (S.E.), D.I.F.A.T., D.S.P.M.M., D.Q.C.E.S., S.B.C.C., & C.C.Q.C., courses will be conducted in June 2026.
- (iv) Question papers for the admission test will be bilingual i.e. both in Hindi and English. Candidates will have the option to answer the questions in either of the language.
- (v) For counseling, provisionally selected and wait listed candidates will be informed on our web site <https://nsi.gov.in>. They can see the result of selection on the website of the Institute.
- (vi) Candidates already employed in the Sugar Industry will not be allowed to work in their factory during the course.
- (vii) Application form for S.B.C.C course should be accompanied by the nomination form duly completed and signed by competent authority under his/her seal, as mentioned in the prescribed form.
- (viii) Applicants are advised not to give any undertaking to the nominating factory in the matter of training or employment as during their tenure at the Institute they will be guided by the rules, regulations and arrangement made by the Institute.
- (ix) Mobile Phone, Smart Watch or any such smart electronic device is not allowed inside Examination Hall.

## 9. GUIDELINES FOR FILLING THE APPLICATION FORM

- (a) **1<sup>st</sup> step:** - Eligibility Checking Online (Student Registration Number Generated )  
**2<sup>nd</sup> step:** - Application form fill-up online. After successful submission, candidate will receive computer generated filled in application form in pdf format. (One office copy & other student copy)
- (b) The office copy of the application form generated from NSI website should be submitted on the day of counselling at National Sugar Institute, Kanpur along with the following documents:-
  - (i) Self-attested Pass port size Photograph with Application number
  - (ii) Self-Attested copy of the certificate as proof for Date of birth.
  - (iii) Acknowledgement receipt of payment
  - (iv) Self-Attested copies of the mark sheets. [For each Year / Semester of B.Sc./B.E., etc.]
  - (v) Original copy of the Nomination Form generated from NSI website by on line application at the time of submission of form. [Compulsory for SBCC]
  - (vi) For S.C./S.T. category candidates, Self-attested copy of certificate from appropriate authority in the rank of D.M./Collector/S.D.M./Tehsildar, with legible seal should be submitted.
  - (vii) For OBC (NCL) category candidates, self-attested copy of certificate from appropriate authority in the rank of D.M./Collector/S.D.M./Tehsildar, with legible seal should be submitted. The Certificate should be issued after 31.03.2025.
  - (viii) For EWS category candidates, self-attested copy of certificate from appropriate authority in the rank of D.M./Collector/S.D.M./Tehsildar, with legible seal should be submitted. The Certificate should be issued after 31.03.2025.

- (ix) For candidates belonging to RURAL CATEGORY, the certificate must be given in prescribed form generated from NSI website at the time of submission of form.
- (x) For candidates belonging to DEFENCE CATEGORY, are required to submit the self-attested copy of certificate from Secretary, Kendriya Sainik Board, Delhi/Secretary, Rajya/ Zila Sainik Board/Officer In-charge, Records office/Ist Class Stipendiary Magistrate.
- (xi) For candidates belonging to physically challenged category, the self-attested copy of certificate should be on the letter head duly signed by the Chief Medical Officer with seal.
- (xii) At the time of counselling, original Experience certificate(s) should be submitted on the official letter head of Factory/Organization only. **[Compulsory for SBCC and for Executive ANSI (SE) Entry]**
- (xiii) Admit card will be available online from NSI website.
- (xiv) Other informations/instructions regarding uploading of documents while filling the application form will be displayed on the website

## 9.1 GUIDELINES TO DRAW THE MERIT LIST OF CANDIDATES OF ALL CATEGORY

**In case of equal marks obtained by the candidates in a particular course in entrance examination following steps are to be adopted-**

- (i) Firstly the percentage of marks obtained in essential eligible qualification shall be considered. If the CGPA or SGPA system is mentioned/ awarded, then the converted figure of percentage will be calculated on the basis of methodology adopted by the concerned university. If no such calculation is available, in that case the calculation shall be done as per prescribed AICTE formula.
- (ii) In the case of failure of point no. 1, the year of passing/ attaining essential eligible qualification shall be considered. The candidate who passed earlier would be considered over the others.
- (iii) In case of failure of point no. 1 and 2, the date of birth of the candidate would be considered and elder candidate to be preferred over the younger.

## 9.2 GUIDELINES FOR FILLING THE SEATS

- (i) To fill up the seats available in the General and other reserved categories, the General seats may be filled on the basis of overall rank whereas reserved seats shall be filled on the basis of merit in their respective reserved category rank. In the case of filling of reserve categories vacant seats, firstly Scheduled Tribe seats shall be filled and in case of seats remaining unfilled shall be transferred to Scheduled Caste category. If any seats in Schedule Caste category remain unfilled they will be transferred to Other Backward Category and finally the vacant seats shall be transferred to General category. In case of EWS vacant seats may be transferred to General category.
- (ii) If seats remain vacant after 1st counselling, the absent candidates of 1st counselling shall also be considered for the subsequent counselling along-with other candidates on approval of competent authority.

## 10 RULES FOR ATTENDANCE AND LEAVE

- (i) A student is required to put in a minimum of 75 percent attendance during each session in each subject. Non-compliance of this rule will render him liable to be debarred from appearing at the Examination.
- (ii) Ordinarily, leave for 15 days is admissible to a student in an academic year in special circumstance such as Medical, etc.
- (iii) Application of leave for absence must be handed over at the Education Section on the prescribed format.
- (iv) Application for Sick leave must be accompanied by a certificate from the Medical Officer of the Hostel.
- (v) Absence without leave by a student drawing a scholarship may result in the cancellation or reduction of his/her scholarship.

<b>TENTATIVE IMPORTANT DATES AND INFORMATION FOR APPLICANTS</b>	
<b>For Foreign Candidates</b>	
On- line submission of application forms	From 16 <sup>th</sup> April,2026 onwards
Last date for submission of on-line Applications	25 <sup>th</sup> May, 2026 upto 5:00 PM
<b>For Indian Candidates</b>	
On- line submission of application forms	From 16 <sup>th</sup> April,2026 onwards
Last date for submission of on-line Applications	25 <sup>th</sup> May, 2026 upto 5:00 PM
Application Fee –For all candidates except SC/ST	Rs. 1500/-
Application Fee – for SC /ST Candidates	Rs. 1000/-
Application fee should be made through Online Transaction	Account Name: NSI KANPUR Account No: 10298336082 IFSC Code: SBIN0001962 Account Type: Current Account Bank Name: State Bank of India
Downloading of Admit Cards from website by all applicants	01 <sup>st</sup> June, 2026 onwards
Date of Admission Test for ANSI (ST), ANSI (SE), DIFAT, DSPMM, DQCES, SBCC & CCQC.	07 <sup>th</sup> June, 2026 (Sunday) at Pune, Chennai, Meerut, Gorakhpur, Bhopal, Delhi, Kanpur, Kolkata, Patna etc. (Tentative)
Address for all Correspondence	Director, National Sugar Institute, Kalyanpur Kanpur- 208017 E-Mail: <a href="mailto:nsikanpur@nic.in">nsikanpur@nic.in</a> , <a href="mailto:nsikanpureducation@gmail.com">nsikanpureducation@gmail.com</a>
For More Information	Website: <a href="https://nsi.gov.in">https://nsi.gov.in</a>

# SYLLABUS FOR ENTRANCE EXAMINATION

A.N.S.I. (SUGAR TECHNOLOGY) COURSE-2026

## MATHEMATICS (SECTION -A)

- 1 ALGEBRA AND TRIGONOMETRY** Group, Permutation groups, Subgroups, Order of a group, Order of an element, Centre and Normalizer, Cyclic groups, Coset decomposition, Lagrange's theorem, Homomorphism and Isomorphism, Cayley's theorem, Normal Subgroups, Kernel of the Homomorphism, Quotient group, Fundamental theorem of Homomorphism. First, Second, and third theorem of Isomorphism, Introduction of rings, subrings, integral domains and fields, characteristic of a ring, homomorphism of ring, ideals quotient rings.  
Sequence and its convergence, Monotonic sequences, Monotone convergence theorem, Cauchy first and second theorem of limits, Cesaro's theorem on limits, Convergence of infinite series, Comparison test, Ratio test, Root test, Raabe's test, Logarithmic test. Alternating series, Leibnitz's test, Absolute and conditional convergence. Complex functions, Exponential, Direct and inverse trigonometric and hyperbolic functions, Modulus-Argument form of complex numbers, Logarithms of complex numbers, Separation into real and imaginary parts of complex numbers.
- 2 MATRICES-** Addition and multiplications, elementary row and column operations, rank determination, solution of system of linear equations, Eigen values and Eigen vectors, Cayley-Hamilton theorem.
- 3 CALCULUS-** Limit, Continuity, Properties of continuous functions in closed intervals, Intermediate value theorem, Discontinuity of a function, Differentiability, Rolle's theorem, Mean Value theorem, Taylor's theorem. Maxima and Minima, Partial differentiation and its application, Euler's theorem on homogeneous functions, First and second differentiability coefficient of an Implicit function, Tangents and normals, curvature, asymptotes, double points, points of inflexion and curve tracing, Riemann integral, Fundamental theorem of calculus, Integral as a limit of sums, Rectification, Quadrature, volume and surface of solids of revolution, Double and Triple integration, Change of order of integration, Dirichlet's theorem and Liouville's theorem.
- 4 DIFFERENTIAL EQUATIONS-** Order and degree of a differential equation, Ordinary differential equations of first order and first degree. Differential equation of the first order but not of the first degree, Clairaut's equation and singular solutions, Geometrical interpretations, Envelope, Linear differential equations of higher order with constant coefficients, Equations reducible to linear equation with constant coefficients (Cauchy's-Euler's equations).
- 5 GEOMETRY-** Polar equation of a conic, Three dimensional geometry for planes and straight lines, Direction cosines and projections, Sphere.
- 6 MECHANICS-** Velocity and acceleration along radial and transverse direction and along tangential and normal directions. Simple Harmonic Motion, Inverse Square Law, Projectiles. Common centenary and centre of Gravity.
- 7 MATHEMATICAL STATISTICS-** Discrete and continuous distributions (Binomial, Poisson's and Normal Distributions), Moments, Correlation and simple linear Regression.
- 8 VECTOR ALGEBRA AND VECTOR CALCULUS-** Vector addition, scalar multiplication and vector multiplication, Vector Differentiation and vector integration, Gradient, Divergence and curl and their applications, Line, Surface and Volume integrals, Gauss Divergence theorem, Green's theorem, Stokes theorem.

## CHEMISTRY (SECTION- B) GENERAL & PHYSICAL CHEMISTRY

- 1. Chemical equilibrium-** Reversible reaction Characteristics of chemical equilibrium, Homogeneous and heterogeneous system, equilibrium constant, effect of temperature on equilibrium constant; Law of mass action; definition, verification and its application to simple homogeneous and heterogeneous systems. Le Chatelier's & Braun's Principle, its application.
- 2. Colloids** – General method of preparation, properties and uses of colloids; Lyophilic and Lyophobic sol, charge on colloidal particles; Stability, protection and coagulation of colloids; Gold number and its application, Tyndall effect, Brownian Movement, Application of Colloids.
- 3. Electrochemistry-** Specific, Equivalent and Molar conductivities. Ionic conductance, ionic

mobility, Kohlrausch Law. Transport number and its determination. Solubility of sparingly soluble salts. Electrode potential and Nernst equation, Reference electrodes, description and working of hydrogen and glass electrodes and their use in pH determination. Common ion effect, solubility product and its application.

4. **Chemical Kinetics**- Rate of reaction, Factors influencing, the rate of reaction, Molecularity and order of a reaction, Derivation of rate constant of zero, first and second order reaction, Half life of a reaction.
5. **Catalysis**- characteristics, classification, homogeneous, heterogeneous catalysis, enzyme catalysis and miscellaneous examples.

### ORGANIC CHEMISTRY

1. Classification and nomenclature of organic compounds, Isomerism and stereochemistry. Fundamental concepts in organic reaction mechanism, Methods of purification; Qualitative and quantitative analysis of organic compounds; Modern methods of structure elucidation.
2. **Hydrocarbons and heterocycles**:- Preparation and properties of alkanes, alkenes and alkynes; Aromatic hydrocarbons, aromaticity. Preparation, properties and structure of Benzene. Aromaticity and chemistry of pyrrole, furan, thiophene and pyridine.
3. **Organic compounds with functional group**:- General methods of preparation, physical and chemical properties and important uses of haloalkanes, haloarenes, polyhalogen compounds, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids and derivatives of carboxylic acids, sulphonic acid, thiols, cyanides, isocyanides, amines, nitro and azo compounds.
4. **Bio-molecules**:- Carbohydrates- Classification, structure of D-glucose and fructose (open and ring structure), inter- conversion of monosaccharide's: aldose to ketose, ketose to aldose, pentose to hexose, hexose to pentose, Killiani's synthesis, Wohl's degradation, epimerization. Disaccharides- manufacture of sucrose, structure and their common reaction, Polysaccharides. Structure and function of nucleic acids, lipids and vitamins.
5. **Polymers**:- Nomenclature and classification of polymers, Types of polymerization, Molecular mass of polymers; Some commercially important polymers. Bio-molecules: Structure and function of carbohydrates, proteins, nucleic acids, lipids and vitamins.
6. **Chemistry in Everyday life**:- Dyes, Chemicals in medicines, Chemistry of rocket propellants, Chemicals in food, Soaps and Detergents

### INORGANIC CHEMISTRY

1. Periodic properties- Ionization potential, Electron affinity, Electronegativity, Atomic and Ionic radii, hybridization, Polarization, Effective nuclear charge, Shielding or screening effect, Slater rule, Ionization enthalpy, Electron gain enthalpy.
2. Oxidation states and oxidation number, Oxidation and Reduction, common oxidizing and reducing agents, ionic equations and balancing of chemical reactions by oxidation- reduction method, Electrode potential, Electrochemical series.
3. Coordination compounds-double and complex salts, Definition: complex-ion coordination number, nomenclature. Werner's theory of complexes, effective atomic number, stability of complexes, Stability constant, factors affecting stability, valence bond theory, crystal field theory of complex compounds, methods of study of complexes, Isomerism in coordination compounds
4. Principles of inorganic chemical analysis.
5. Study of d-Block elements and little bit about Lanthanoid-contraction, magnetic behavior, Effective magnetic moment.
6. Metal Carbonyl and idea of back bonding, Effective atomic number rule, The stability of metal carbonyl.

## PHYSICS (SECTION- C)

1. **Newtonian Mechanics and Wave Motion:** Dynamics of a system of particles, Laws of conservations, Rotating frames of reference, Moment of inertia of simple bodies, Combined translational and rotational motion of rigid body on horizontal and inclined planes, Relations between elastic constants, Bending of beam, Torsion of cylinder, Differential equation of Simple Harmonic Motion, Damped and forced vibrations, Principle of superposition of waves, Phase and group velocity.
2. **Thermodynamics and Kinetic theory of gases:** Laws of thermodynamics, Isothermal and adiabatic expansions, Carnot cycle, Carnot theorem, Entropy, Clausius- Clayperon equation, Joule Tomson effect, Law of equipartition of energy and its application to specific heat of gases, Black body radiation and Planck's law.
3. **Circuit fundamentals and semiconductor devices:** Growth and decay of current through R-L circuit, Charging and discharging of capacitors in RC, LC and RLC circuits, Thevenin's and Norton's theorem, AC bridges: Maxwell's, Anderson's, Wien's and De Sauty bridges Semiconductors, Diode as rectifier, Zener Diode, Filter circuits, Tunnel diode, LED and photodiodes, Transistor basics, Cathode ray oscilloscope, its working and applications.
4. **Electromagnetic theory:** Electric field and potential due to an electric dipole and quadrupole, Gauss Law and its applications, Dielectrics, Lorentz force, Bio-savart Law, Ampere's circuital theorem, Dia, para and ferromagnetic materials, magnetic susceptibility and permeability, Hysteresis, Faraday's Laws of electromagnetic induction, Lenz's Law, Mutual & Self-induction, Poynting vector, Plane electromagnetic waves in free space and nonconducting media.
5. **Physical Optics and Lasers:** Interference, Spatial and temporal coherence, Fresnel biprism, Parallel thin films Newton's rings, Michelson and Fabri-Perot interferometer, Diffraction Fresnel's half period zones, Fraunhofer diffraction at a single slit, double slit and diffraction grating, Resolving power of telescope, Polarization, double refraction in uniaxial crystal, Nicol Prism, retardation plates, Optical rotation and Fresnel's explanation, Polarimeters, lasers characteristics, population inversion, Einstein's coefficients, Application of lasers.
6. **Perspectives of Modern Physics:** Inertial and non-inertial frames, Galilean transformation, Michelson-Morley experiment, Lorentz transformation, Length contraction and time dilation, Transformation of velocity, acceleration and mass, Mass-energy relationship, Photoelectric effect, Compton effect, de Broglie hypothesis, Matter waves and its experimental verification
7. **Basic electronics and Fiber Optics:** Transistor amplifiers and its classifications, Transistor biasing circuits and stability, Positive and negative feedback, Phase shift and Wein bridge oscillators, Basics of optical fiber, Step index and graded index fibers, Numerical aperture, fiber losses
8. **Classical and Statistical Mechanics:** Constraints, Generalized coordinates, De-Alembert's principle, Lagrange's equations, Kepler's laws of planetary motion, satellites, Hamiltonian equations, simple problems based on Lagrangian and Hamiltonian formulation, Phase space, Macro and micro state, thermodynamic probability, Boltzmann entropy relation, Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics and their applications.
9. **Quantum Mechanics and Spectroscopy:** Wavefunction, normalized, orthogonal and orthonormal wavefunctions, Heisenberg uncertainty principle, Expectation value, Schrodinger equation and its applications to particle in 1D box and 1D harmonic oscillator, Spectra of hydrogen, L-S and j-j couplings, X-ray spectrum and its dependence of voltage, characteristic x- rays, Mosley Law, Braggs Law.
10. **Solid State Physics and Nuclear Physics:** Crystal structures, Cubic lattices, Miller indices, Crystal structure of NaCl and Diamond, Reciprocal lattice, General properties of the nucleus, mass defect and binding energy, Nuclear models. Fission and fusion.

## CHEMICAL ENGINEERING (SECTION -D)

1. **Process Calculation:** Law of conservation of mass and energy; Recycle, bypass and purge calculations; degree of freedom analysis. Ideal gas law, Dalton's law, Amagat's law, Average molecular weight of gaseous mixture, Vapour pressure, Raoult's law and Henry's law.
2. **Thermodynamics:** First and second Laws of thermodynamics. Applications of first law to close and open

systems. Second law and Entropy. Thermodynamic properties of pure substances, Equations of state, fugacity and activity; properties of solutions / mixtures: partial molar properties, chemical potential, activity coefficients, excess properties; Phase equilibria: predicting VLE of systems; chemical reaction equilibria.

3. **Fluid Mechanics and Mechanical Operation:** Fluid statics, Newtonian and Non-Newtonian fluids, Bernoulli equation, flow through pipeline system. Flow meters, Pump and compressors, Elementary boundary layer theory, Flow through packed and fluidized beds. Entrance and exit losses in flow process, Rayleigh's method of dimensional analysis, Buckingham Pi theorem. Particle size and shape, particle size distribution, size reduction and classification of solid particles; Free and hindered settling; Centrifuge and cyclones; Filtration, mixing and agitation.
4. **Heat Transfer:** Conduction, convection and radiation, Heat transfer coefficients, Boiling, condensation and evaporation; types of heat exchangers and evaporators and their process calculations, design of double pipe, shell and tube heat exchangers, and single and multiple effect evaporators.
5. **Mass Transfer:** Fick's law, molecular diffusion in fluids; Theories of mass transfer: film, penetration and surface renewal theories; Momentum, heat and mass transfer analogies; distillation, absorption, leaching, liquid-liquid extraction, drying, humidification and dehumidification, crystallization, adsorption.
6. **Chemical Reaction Engineering:** Theories of reaction rates; kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, kinetics of enzyme reactions (Michaelis-Menten and Monod models), non-ideal reactors; residence time distribution, single parameter model; non-isothermal reactors; kinetics of heterogeneous catalytic reactions; diffusion effects in catalysis; rate and performance equations for catalyst deactivation.
7. **Chemical Technology:** Sulphur dioxide, sulphuric acid; Pulp and paper; Lime; Carbon dioxide, Activated carbon; Surface coatings - paints, pigments, and varnishes; Sugar industry.

***Question paper will consist of four sections i.e. Mathematics, (weightage 20%), Chemistry (weightage 40%) & Physics (weightage 20%)& Chemical Engineering (weightage 20%). The questions will be of objective type and the candidate should attend all the questions.***

# SYLLABUS FOR ENTRANCE EXAMINATION A.N.S.I. (SUGAR ENGG.) COURSE - 2026

## MECHANICAL ENGINEERING & PRODUCTION ENGINEERING (SECTION- A)

- 1. Thermodynamics:-** Basic concepts of thermodynamic system, Microscopic and macroscopic properties, intensive and extensive properties, thermodynamic equilibrium, Zeroth law, First law, Second law of thermodynamics, quasi-static, reversible, irreversible, flow, non-flow, steady flow, throttling processes and free expansion, Concepts of displacement work, Transfer of heat and work, Carnot cycle, etc. Refrigerant, Vapor compression refrigeration system, Air-conditioner, Atmospheric air – Psychrometric Properties and Psychrometric chart.
- 2. Heat transfer:-** *Conduction*-thermal conductivity, conduction through flat wall, hollow cylinder, composite cylinder, sphere; *Convection* - free and forced convection, Laminar flow and turbulent flow, LMTD, heat exchanger; *Radiation* - absorption, reflection and transmission of radiation, plank's Law, Stefan-Boltzman's law, heat transfer coefficient for radiation.
- 3. Combustion of fuels :-***Fuels* –solid, liquid & gas, nuclear fuels, hydrogen fuel, fuel cells, merits and demerits, heating value of fuel, combustion equations, complete combustion condition, gravimetric analysis, conversion of mass analysis to volumetric analysis, excess air, flue gas analysis by Orsat apparatus, Bomb calorimeter.
- 4. Properties of steam, steam generators, steam turbines and condensers:-**  
Steam: Steam and its properties at various temperatures and pressures, steam tables, Enthalpy and entropy of wet and superheated steam, constant pressure, constant volume, adiabatic, isothermal, polytropic processes, dryness fraction, Mollier diagram. Steam Generators: Boilers and it's functions, types, mountings, accessories, draught, chimney design; Steam turbines: Basic Configuration, impulse & reaction turbine construction, operation, performance, governing and applications. Condensers: Function, Classification, mass of cooling water required, air removal, vacuum efficiency etc. Cooling pond and cooling towers.
- 5. Internal combustion Engines, Air Compressors, Gas Turbines:-**  
Classification of I.C. Engines, cyclic operations, Two stroke and four stroke cycle engines, Otto cycle, diesel cycle and dual cycle, efficiency, scavenging, detonation, Octane number and Cetane Number, super charging, carburetor, spark plug, fuel pump, atomizer, etc. Engine power – indicated and brake power, Pollution control norms. Gas Turbine: Classification, thermodynamic cycle, turbine, applications and limitations of gas turbine. Air Compressor: Reciprocating, Axial and rotary compressors.
- 6. Mechanical Engineering Design:-**Engineering materials and their properties, simple stresses in machine parts, torsional, bending and variable stresses in machine parts, pressure vessels, pipes and pipe joints, welded joints, screwed joints, keys and couplings, shafts, levers, columns and struts, belt and rope drives, fly wheel, bearings, spur, helical and worm gears, etc.
- 7. Manufacturing Technology:-** Manufacturing cycle, manufacturing processes and their selection, engineering materials and their selection, casting, product design, inspection techniques, casting processes, basic design considerations in casting, plastic deformation, hot and cold working, sheet metal operations, heat treatment processes, metal cutting, tool materials, tool geometry, and nomenclature, cutting fluids, single and multipoint cutting operations, production of gears and screw threads, grinding and finishing process, machines tools, Joining processes, welding process, testing of welded joints, brazing and soldering, mechanical fastening processes, etc.
- 8. Computer Aided Manufacturing and Manufacturing Automation:-** Industry 4.0, CAD/CAM, Computer Aided Design of engineering systems, applications in modeling analysis, design and manufacturing, computer graphics, geometric transformations, Geometric modelling using CAD software, surface and solid models, solid modeling. Reverse Engineering, Finite Element Analysis, definition of automation, reasons for automating, pros and cons of automation, manufacturing operations and automation strategies, production economics, high volume production systems, numerical control production systems i.e. CNC, DNC and adoptive control, industrial robots, automated material handling, storage and retrieval system, automated inspection and testing principles and methods, sensor technologies for automated inspection, Flexible manufacturing, Rapid Prototyping /Additive manufacturing, FDM based 3D printing.

## ELECTRICAL ENGINEERING (SECTION – B)

1. **Electromagnetic Induction:-** Relation between magnetism and electricity, production of induced emf and current, Faraday's law of electromagnetic induction, Lenz's law, types of induced emf, coefficient of self-inductance and mutual inductance, coefficient of coupling.
2. **A.C. Fundamentals:-** Generation and equations of alternating voltage and current, wave form, cycle, time period frequency, amplitude etc., different forms of emf equation, phase, phase difference, Average and R.M.S. value of half wave rectified, Ripple Factor, Form Factor, phasor representation of alternating quantities, A.C. through resistance, inductance and capacitance
3. **A.C. Circuits:-** Series A.C. circuit, power factor, active and reactive components of circuits, current, Q-factor of a coil, power in an iron cored choking coil, resonance in R.L.C. circuit, graphic representation of resonance, resonance curve, Q-factor of series circuit, parallel A.C. circuits, Vector and phasor method, application of admittance method, complex or phasor algebra, series – parallel circuits, parallel equivalent of a series circuit, resonance in parallel circuit, phase sequence, parallel circuit, polyphase circuits, generation of three phase velocity, numbering of phase, inter connection of three phase, star/delta connection, power factor improvement, power measurement in 3 phase circuit.
4. **D.C. Generators:-** Principles, working and construction, types of generators, generated emf and emf equation, losses, efficiencies, characteristics of DC generators, no load curve, critical resistance, critical speed, voltage built up of shunt generators, series generators, compound generators, application of generators
5. **D.C. Motors:-** Principle, comparison with generators, significance of back emf, voltage equation, torque, speed regulation, motor characteristics, performance curves, losses, power stages and efficiency, Special Electrical Machines.
6. **Transformer:-** Principle of working, construction, emf equation, voltage transformation ratio, losses, equivalent circuit and approximate equivalent circuit, transformer tests, regulation efficiency, autotransformer, equal and unequal voltage ratio, three phase transformer, connections, parallel operation phase conversion, current transformer, potential transformer
7. **Induction motors:-** Classification, principle and construction, slip frequency of motor current, relation between torque and rotor, power factor, starting torque, effect of change in supply voltage, rotor emf and resistance under running conditions, torque under running conditions, relation between torque and slip, measurement of slip.
8. **Alternator:-** Basic principle, construction, armature windings, pitch factor, distribution factor, equation of induced emf, vector diagram of a loaded alternator, voltage regulation, three phase alternator, parallel operation of alternators, synchronizing alternators, synchronizing current, power and torque, effect of unequal voltage distribution of load
9. **Power system components:** Single line diagram of power system, brief description of power system elements, synchronous machine, transformer, transmission line, busbar, circuit breaker and isolator, concepts of FACTS, Power System Protection and Safety.
10. Transmission and Utilisation of Electricity.

## INSTRUMENTATION ENGINEERING (SECTION – C)

1. Basic concepts of measurements, system configuration, accuracy, precision, error, linearity, hysteresis, resolution, threshold, span, calibration, dead zone.
2. Electrical Transducer.
3. Measurement of displacement by LVDT and strain gauge.
4. Measurement of pressure, vacuum, temperature, flow, level, pH, conductivity, viscosity.
5. Measurement of force and torque.
6. Data acquisition, A to D converter, D to A converter, signal conditioner, multiplexer, demultiplexer.
7. Digital signal transmission and processing.
8. Microprocessor basics, Microcontroller fundamentals.

9. Basic Electronics: Diode, Triode, Transistor, Amplifier, Rectifier, Zener Diode, Voltage Regulator, Thyristor (SCR), TRIAC, Logic gates and its applications.
10. Introduction to Electronic communication.
11. Introduction to data communication and networking.

### **PROCESS CONTROL**

Measurement of process variables; sensors, transducers and their dynamics, transfer functions and dynamics responses of simple systems, process reaction curve, controller modes (P, PI and PID); control valves; analysis of closed loop systems including stability, frequency response and controller tuning, cascade, feed forward control.

***Question paper will consist of three sections i.e. Mechanical Engineering and Production Engineering Electrical Engineering and Instrumentation Engineering. Each section will be of equal marks The questions will be of objective type and the candidate should attend all the questions.***

**SYLLABUS FOR ENTRANCE EXAMINATION**  
**POST GRADUATE DIPLOMA COURSE IN INDUSTRIAL FERMENTATION AND**  
**ALCOHOL TECHNOLOGY (D.I.F.A.T) -2026**

**CHEMISTRY (SECTION -A) GENERAL & PHYSICAL CHEMISTRY**

1. **Chemical Equilibrium:-** Reversible reaction Characteristics of chemical equilibrium, Homogeneous and heterogeneous system, equilibrium constant, effect of temperature on equilibrium constant; Law of mass action ; definition, verification and its application to simple homogeneous and heterogeneous systems
2. **Colloids:-** General method of preparation, properties and uses of colloids; Lyophilic and Lyophobic sol, charge on colloidal particles; Stability, protection and coagulation of colloids; Gold number and its application, Application of Colloids.
3. **Electrochemistry:-** Specific, Equivalent and Molar conductivities. Ionic conductance, ionic mobility, Kohlrausch Law. Transport number and its determination. Solubility of sparingly soluble salts. Electrode potential and Nernst equation, Reference electrodes, Description and working of hydrogen and glass electrodes and their use in pH determination.
4. **Chemical Kinetics:-** Rate of reaction, Factors influencing, the rate of reaction, Molecularity and order of a reaction, Derivation of rate constant of zero, first and second order reaction, Half life of a reaction.

**ORGANIC CHEMISTRY**

1. Classification and nomenclature of organic compounds, Isomerism and stereochemistry. Fundamental concepts in organic reaction mechanism, Methods of purification; Qualitative and quantitative analysis of organic compounds; Modern methods of structure elucidation.
2. **Hydrocarbons:-** Preparation and properties of alkanes, alkenes and alkynes; Aromatic hydrocarbons, aromaticity. Preparation, properties and structure of Benzene. Aromaticity and Aromatic characteristics of pyrrole. furan, thiophene and pyridine.
3. **Organic compounds with functional group:-** General methods of preparation, physical and chemical properties and important uses of haloalkanes, haloarenes, polyhalogen compounds, ethers, aldehydes, ketones, carboxylic acids and derivatives of carboxylic acids, sulphonic acid, thiols, cyanides, isocyanides, amines, nitro and azo compounds.
4. **Alcohols and phenols:-** Comparative study of substitution, dehydration, oxidation, and esterification of primary, secondary and tertiary alcohols; General methods of preparation and reactions. Reimer-Tiemann and Kolbe reactions. Relative acidity of phenol, alcohol and carboxylic acid.
5. **Bio-molecules:-** Structure and function of carbohydrates, nucleic acids, lipids and vitamins.
6. **Bio-gas-Raw:-** Materials, Properties/characteristics of bio gas, Principles of Bio-Conversion; Bio gas applications.

**INORGANIC CHEMISTRY**

1. Periodic properties- Ionization potential, Electron Affinity, Electro negativity, Atomic and Ionic-radii, Polarization, Effective nuclear charge, Shielding or screening effect, Slater rule, Ionization enthalpy, Electron gain enthalpy.
2. Oxidation states and oxidation number, Oxidation and Reduction, common oxidizing and reducing agents, ionic equations and balancing of chemical reactions by oxidation- reduction method, Electrode potential, Electrochemical series.
3. Coordination compounds-double and complex salts, Definition: complex-ion coordination number, nomenclature. Werner's theory of complexes, effective atomic number, stability of complexions, Stability constant, factors affecting stability, valence bond theory, crystal field theory of complex compounds, methods of study of complexes, Isomerism in coordination compounds
4. Principles of inorganic chemical analysis.

## INDUSTRIAL CHEMISTRY & APPLIED CHEMISTRY- (SECTION- B)

### **1. Industrial Aspects of Organic and Inorganic Chemistry.**

1. Nomenclature: Generic names, Trade names
2. Raw materials for organic compounds: Petroleum, Natural gas, Fractionation of crude oil, cracking, reforming, hydro forming and Isomerisation.
3. Coal: Types of coal, properties, calorific value, distillation of coal, chemicals derived from them. 4. Renewable Natural resources: Cellulose, Starch:-properties, modification, important industrial chemicals derived from them. Alcohols, oxalic acid and Furfural.
4. Metallurgical operations pulverization, calcination, roasting refining etc. extraction of iron, copper, lead, silver, sodium, aluminium etc.

### **2. Industrial Aspects Of Physical Chemistry**

1. Surface chemistry and Interfacial phenomena: Adsorption isotherm, Sols, Gels, Emulsions, Micro emulsions, Micelles, Aerosols, Effect of Surfactants, Hydro tropes.
2. Catalysis: Introduction, Types, Basic principles, mechanisms, factors affecting the performance, introduction to phase transfer catalysis, Enzymes catalyzed reactions- rate model, industrially important reactions.

### **3. Material Science and Industrial Pollution.**

1. Polymeric Materials: Industrial polymers and composite materials—their constitutions, chemical and physical properties.
2. Industrial pollution: Pollutants and their statutory limits, pollution evaluation methods. Water pollution – organic/inorganic pollutants Pesticide pollution, Radiation pollution and Green House Effect.

### **4. Effluent treatment & Waste management and Process Instrumentation.**

1. Principles and equipment for aerobic, anaerobic treatment, adsorption, sedimentation. Electrostatic precipitator, Mist eliminator, Wet scrubbers, Absorbers.
2. Solid waste management, Industrial safety.
3. Thermometer, pH meter, conductivity meter, manometer, barometers, pressured gauge,

### **5. Environmental Analysis in Process Industries.**

Environmental Chemistry, determination of pH, acidity alkalinity, total suspended solids (TSS), total dissolved solids (TDS), total hardness and Ca & Mg hardness, chloride, sulphate, nitrate, oil and grease, DO, COD, BOD chlorine demand, limit test for heavy metals- Pb, As, Hg, Fe and ash content

## BIOCHEMISTRY & BIOTECHNOLOGY (SECTION -C)

### **1. MOLECULAR GENETICS**

Basic structure and function of cell, cell cycle, control of cell cycle, Chromatin organization, Molecular basis of life: Structure and function of DNA and RNA; basics of cell signalling, Bioenergetics: Laws of thermodynamics. Mendelian principles and inheritance, Law of segregation, Law of independent assortment, Sex determination and sex-linked inheritance. Basics of DNA replication, transcription and translation

### **2. GENERAL BIOCHEMISTRY**

1. CARBOHYDRATES Structure and properties of monosaccharide, disaccharides. oligosaccharides and polysaccharides, Mutarotation, Inversion of sucrose, color test with sugars, Estimation of total reducing sugar by fehling solution, tests to differentiate aldehyde and ketone. Metabolism of carbohydrates including glycolysis, HMP pathway, glyoxalate cycle, TCA cycle, Entner- Duodoroff pathway, gluconeogenesis, Pasteur effect.
2. PROTEINS : Outline of the structure of the common amino acids present in proteins, their general properties, metabolism of amino acids including deamination, transamination and decarboxylation, physical & chemical properties, classification and structure of proteins. Isolation, purification and

estimation of proteins. Denaturation of proteins & factor affecting denaturation of proteins.

3. **LIPIDS:** Fatty acids and their types naturally occurring fatty acids, structure, properties and nomenclature, essential and non-essential fatty acids, triacylglycerol's and their derivatives.
4. **NUCLEIC ACIDS:** Outline of the structure & functions of purine & pyrimidine bases, nucleosides and nucleotides, structure and biosynthesis of nucleic acids. Genetic Code, Evidence & Essentiality of Codon, Triplet code, start and stop codons. Overlapping genes and reading frames, universality of genetic code, Protein synthesis, mechanism in prokaryotes, Post translational modification and cell secretion.
5. **ENZYMES:** Nature, occurrence, classification of enzymes, outline of enzyme kinetics, competitive, non-competitive and uncompetitive inhibition, enzyme activity and importance of enzymes in fermentation industry
6. **Vitamins and Minerals:** Classification of Vitamins, deficiency diseases & their symptoms, dietary sources of vitamins, classification of minerals, micro & macro nutrients & their biochemical functions food supplementations. Fortification & Enrichment of micronutrients.

### 3. **GENERAL MICROBIOLOGY**

The microscope, spontaneous generation, biogenesis, fermentation, germ theory of diseases, Microbial Diversity: Prokaryotes and Eukaryotes, Microalgae, Microfungi, Protozoa, Bacteria and Viruses, Bacterial size, shapes and pattern of arrangement, Structures external to cell wall: Flagella, Pili, Capsule, sheath, Prosthecae and stalk. The cell wall structure: Gram positive and gram-negative bacteria. Structures internal to cell wall: Cytoplasmic membrane, Cytoplasmic inclusion and nuclear material. Reproduction and growth of bacteria & Yeast. Modes of cell division, Growth curve, Lag phase, Exponential phase, stationary phase and death phase, Nutritional requirements. Nutritional types of bacteria, Phototrophs, Chemotrophs, Autotrophs, Heterotrophs, Obligate parasites. Bacteriological media, Selective media, Maintenance media, Differential media. Gram staining cell size measurement, cell count: viable & dead cells. Culture preservation techniques. Pure culture, pure culture isolation techniques. Control of microorganisms, Definitions and fundamentals of control, Physical agents / processes for control: high temperatures, low temperature, desiccation, osmotic pressure, radiation, filtration, host parasite interaction: pathogenicity, virulence and infection.

Nature of the Gene, one gene one enzyme hypothesis, gene-protein relation, Genetic fine structure, Colinearity of gene & protein, Inducible and constitutive operons, Manipulation of DNA: denaturation of DNA by heat, reassociation of complementary strands, Engineering: restriction enzymes, formation of recombinant DNA, vectors, cloning strategies, detection of clone genes, applications of recombinant DNA technology, PCR technology.

### 4. **AN INTRODUCTION TO IMMUNOLOGY**

Introduction to immunology, Innate and adaptive immunity; Defense mechanisms of host: physical barriers, chemical barriers, biological barriers, Fever, Inflammation and Phagocytosis

## **CHEMICAL ENGINEERING (SECTION - D)**

1. **Material balance:-** Law of conservation of mass and energy; Recycle, bypass and purge, and its calculations; degree of freedom analysis. Ideal gas law, Dalton's Law, Amagat's Law, Average molecular weight of gaseous mixture, vapour pressure, Dalton's Law and Henry's Law.
2. **Energy balance:-** Heat capacity of pure gases and gaseous mixtures, sensible heat, changes in liquids, enthalpy changes.
3. **Fluid flow:-** Fluid statistics, Newtonian and non-Newtonian fluids, Bernoulli's equation, Flow through pipeline systems, flow meters, pump and compressors, vacuum pumps, ejectors.
4. **Heat transfer:-** Conduction, convection and radiation. Heat transfer coefficients, boiling and condensation; types of heat exchangers like shell and tube type, double pipe heat exchanger, and plate type heat exchanger.
5. **Distillation:-** Introduction, phase equilibria, equilibrium diagram and boiling point diagram. Binary systems and their distillation systems, batch distillation and continuous distillation and the details of distillation columns, both Plate and packed type, separation of azeotropes.

## BIOCHEMICAL ENGINEERING

1. **Introduction:-** Definition and scope of Biochemical Engineering, history of biochemical engineering, commercial aspects of biochemical processes, different biochemical unit operations and processes.
2. **Microbial Growth Kinetics:-** Media design optimization and preparation for growth of microorganisms, Microbial growth in closed, semi open and open cultivation systems, maintenance energy and yield concept, parameters of growth and analysis of growth data, microbial kinetics of growth, substrate utilization and product formation in batch, plug flow and chemo state culture.
3. **Media and Air Sterilization:-** Principles and design of batch and continuous media sterilization processes. Theory and methods of air sterilization, Design of air filters.
4. **Aeration and Agitation :-** Demand and supply of oxygen in microbial system, mass transfer theory concept of Volumetric mass transfer coefficients ( $K_L a$ ), factors affecting it and methods for measurement power requirements in gassed and un-gassed systems, Rheology of fermentation fluids
5. **Kinetics of Enzymatic Reactions:-** Characteristics of enzymes, Enzyme catalyzed reactions, Factors influencing the rate of enzymatic reactions, Michaelis-Menten Kinetics, Estimation of  $V_{max}$  and  $K_m$ . Immobilization of enzymes
6. **Bioreactors and Scale up:-** Mode of reactor operation, Ideal reactor models Batch, Fed batch, Extended fed batch, continuous stirred tank (CSTR), plug flow mono chemo state, scale-up criteria selection of scale-up criteria practical considerations for bioreactor contraction
7. **Bioreactor control mechanisms:** Control of physical, chemical and biological environment of the bioreactor. Advanced control strategies viz. PID controllers, fuzzy logic based controllers and artificial neural and artificial neural network based controllers, Role of physical, chemical & biological sensors.
8. **Downstream Processing:** Role of downstream processing, Recovering and purification of products problems and requirements of bio product purification, separation processes flocculation sedimentation, centrifugation, Filtration, Extraction, Distillation and operation, chromatography, electro dialysis, drying, ultra-filtration, electrophoresis and isoelectric focusing, cell disruption.
9. **Biological waste-water treatment:-** Principle of biological oxidation of waste water, mathematical expressed and graphical representation of BOD removal and sludge growth, operation and design features of aerobic biological treatment processing oxidation pond, trickling filter, rotating biological reactor (RBC). Activated sludge process, Anaerobic treatment system sludge digestion theory, digester design, high rate digestion UASB, Nitrification and denitrification Phosphorus removal, characterization and treatment of waste water of the sugar industries such as distilling, Brewing, and antibiotics.

***Question paper will consist of four sections i.e. Chemistry (weightage 25%), Industrial Chemistry/Applied Chemistry (weightage 25%), Biochemistry/Biotechnology (weightage 25%) & Chemical & Biochemical Engineering (weightage 25%). The questions will be of objective type and the candidate should attend all the questions.***

**SYLLABUS FOR ENTRANCE EXAMINATION**  
**POST GRADUATE DIPLOMA IN SUGAR CANE PRODUCTIVITY & MATURITY**  
**MANAGEMENT (DSPMM)- 2026**

**AGRICULTURE CHEMISTRY (SECTION-A)**

- 1. Irrigation & water:**-Water requirement of Sugarcane crops, Relationship of the water requirement with soil texture, control of wastage of irrigation water, quality & Effect of irrigation water.
- 2. Irrigation Methods:**- Flooding Method, Thala Method, Sprinkler & Drip irrigation, Boarder Method, Limitations & benefits of each irrigation Method.
- 3. Measurement of irrigation water:**- 'B' Katawa & Kulawa, Hectare, cm, Meter method of measurement.
- 4. Necessity of Drainage:**-Disadvantages of High Moisture soils, Land development & improvement, Land preparation, General farm management & control.
- 5. Accidents:** -Flood, drought, Cyclone, Earthquake, Sensitive Zones, Control measurement of losses.
- 6. Weeds & Weedicides of sugarcane, sugarbeet, and sweet sorghum**
- 7. Plant protection chemicals used in sugarcane with quantity and method of application.**
- 8. Anatomy of plants.**
- 9. Structure of the flower & the function of different parts.**
- 10. Pollination**
- 11. Fertilization**
- 12. Type of Fruits**
- 13. Seed**
  - (a) External & internal structure of seed.
  - (b) Types of germination.
  - (c) Factor affecting seed germination.
  - (d) Types of seed.
  - (e) Dispersal Methods of seed & their importance.
- 14. Cell and its structural organization**
- 15. Plant physiology**
  - (a) Plant water relation
  - (b) Mineral nitrogen nutrition in plants
  - (c) Cellular respiration.
  - (d) Photosynthesis
- 16. Classification of plants**
- 17. Diversity of life**
  - (a) Five kingdoms of life and Biological classification
  - (b) Kingdom monera
  - (c) Kingdom fungi
  - (d) Kingdom plantae
  - (e) Virus
- 18. Inorganic Chemistry:** - Classification of Elements, Hard & Soft water, Nitrogen & Nitrogen Cycle, Ammonia, Nitric Acid, Carbon, Carbon dioxide, Phosphorus & Phosphoric acid, Sulphur, Sulphur dioxide, Sulphuric acid, Chlorine, Hydrochloric acid, Sodium & Potassium, Calcium, Iron & Aluminum.
- 19. Organic Chemistry:**- Nomenclature & Classification of Organic Compounds, Alkane or Paraffins, Alkene or olefins, Alkyne or Acetylene, Alcohol Glycerol, Aldehyde & Ketone, Carboxylic acid, Amine & Amide, Oil, Fat & Soaps, Carbohydrates, Benzene & phenol.

## CHEMISTRY ( SECTION- B)

1. **Chemical equilibrium**:- Homogeneous and heterogeneous system, equilibrium constant, effect of temperature on equilibrium constant; Law of mass action; definition, verification and its application to simple homogeneous and heterogeneous systems. Le Chatelier's & Braun's Principle, its application.
2. **Colloids**:- General method of preparation, properties and uses of colloids; Lyophilic and Lyophobic sol, charge on colloidal particles; Stability, protection and coagulation of colloids; Gold number and its application, Tyndall effect, Brownian Movement.
3. **Electrochemistry**:- Specific, Equivalent and Molar conductivities. Ionic conductance, ionic mobility, Kohlrausch Law. Transport number and its determination. Solubility of sparingly soluble salts. Electrode potential and Nernst equation, Reference electrodes, Description and working of hydrogen and glass electrodes and their use in pH determination. Common ion effect, solubility product and its application.
4. **Chemical Kinetics**:- Rate of reaction, Factors influencing, the rate of reaction, Molecularity and order of a reaction, Derivation of rate constant of zero, first and second order reaction, Half life of a reaction.
5. Catalysis, characteristics, classification, homogeneous, heterogeneous catalysis, enzyme catalysis and miscellaneous examples.
6. Optical and Geometrical isomerism, asymmetric carbon atom, racemisation and resolution of racemic mixtures, resonance and its application in organic chemistry.
7. Methods of preparation, properties and uses of alcohols, aldehydes, ketones, esters, ethers, amines, amides, amino acids and proteins.
8. Carbohydrates- Classification, structure of D-glucose and fructose (open and ring structure), inter- conversion of monosaccharides: aldose to ketose, ketose to aldose, pentose to hexose, hexose to pentose, Killiani's synthesis, Wohl's degradation, epimerization. Disaccharides- manufacture of sucrose, structure and their common reaction, Polysaccharides

***Question paper will consist of two sections i.e. AGRICULTURE CHEMISTRY (weightage 60%) and CHEMISTRY (weightage 40%). The questions will be of objective type and the candidate should attend all the questions.***

**SYLLABUS FOR ENTRANCE EXAMINATION**  
**POST GRADUATE DIPLOMA IN QUALITY CONTROL & ENVIRONMENTAL SCIENCE**  
**(DQCES)- 2026**

**CHEMISTRY (SECTION- A)**

**PHYSICAL CHEMISTRY**

1. Colloids:- General method of preparation, properties and uses of colloids; solution, types of solution, Buffer solution, Acid & Base Buffer, Buffer capacity, difference between suspension, colloids & solutions, Lyophilic and Lyophobic sol, charge on colloidal particles; Stability, protection and coagulation of colloids; Gold number and its application, Tyndall effect, Brownian Movement.
2. Electrochemistry:- Conduction in metals & in Electrolytes solution, Kohlrausch Law, Debye's Huckel's Onsager's equation. Electrode reactions, Nernst's equation, Electrolytic & Galvanic cell, Calculations of E.M.F, Electrochemical Series.
3. Chemical Kinetics:- Rate of reaction, Factors influencing the rate of reaction, Molecularity and order of a reaction, Half life time, Mean life time, Radioactive Decay,
4. Catalysis, characteristics, classification, homogeneous, heterogeneous catalysis, enzyme catalysis and miscellaneous examples.
5. Crystallization:- Difference between crystalline and amorphous solids. law of crystallography Space lattice and unit cell, Bravais lattices, Seven crystal systems, crystal defects. Point defects; Schottky defects, Frenkel defects.

**ORGANIC CHEMISTRY**

1. Organic chemistry: Classification of organic compounds, Nomenclature of hydrocarbons and compound containing one functional group, homologous series, Isomerism. General methods of preparation and properties of Alkanes, Alkenes and Alkynes. Aromatic hydrocarbons, Structure of benzene. Electrophilic substitution reactions in benzene.
2. Purification of organic compounds:  
*Methods of purification of solids:* Crystallization, fractional crystallization and sublimation.  
*Method of purification of liquids:* Distillation, fractional distillation, distillation under reduced pressure, steam distillation. *Chromatography:* General principles, types, brief outline of thin layer chromatography, paper chromatography and column chromatography, solvent extraction
3. Organic compounds with one functional group: Simple methods of preparation and properties of Halo-alkanes, Alcohols, Phenols, Ethers, Aldehydes, Ketones, Carboxylic acids, Derivatives of carboxylic acid, amino-, cyano-, isocyano-, azo-, and nitro- compounds.
4. Bio-molecules: Structure and function of carbohydrates, nucleic acids, lipids and vitamins.
5. Environmental Pollution: Types of pollution and pollutants, Acid rain, Green House Effect, Eutrophication and Soil erosion. Conservation and protection of environment.
6. Chemistry in Everyday life: Dyes, Chemicals in medicines, Chemistry of rocket propellants, Chemicals in food, Soaps and Detergents.

**INORGANIC CHEMISTRY**

1. Atomic structure: Dual nature of electron, de-Broglie equation, Aufbau Principle, Hund's Rule, Heisenberg uncertainty Principle & Pauli exclusion principle, Atomic orbitals, Quantum number, Orbital, Shapes and Orientation.
2. Periodic properties- Ionization potential, Electron affinity, Electronegativity, Atomic and ionic radii. Polarization, Effective nuclear charge, Shielding or screening effect, Slater rule, Ionization enthalpy, Electron gain enthalpy.
3. Chemical Bonding: Valence bond theory, Valence shell electron pair repulsion theory, Hybridization, Molecular orbital theory, Crystal field theory, Bond energy, Dipole moment, Polar and nonpolar covalent bonds, Co-ordination number, Lattice energy, Fajan rule, Hydrogen bonding, Inert pair

effect, Vander waals forces.

4. Acids and Bases; Arrhenius, Bronsted - Lowry, Lewis, Lux flood, HSAB concept of acid and base.
5. Bio Inorganic chemistry: Essential and traces elements in biological process , Hemoglobin, Myoglobin, chlorophyll, Nitrogen fixation, Biological role of alkali and alkaline earth metal ions with special reference to  $\text{Ca}^{2+}$ .

## **ENVIRONMENTAL SCIENCES & BIO-TECHNOLOGY (SECTION - B)**

### **1. BIOCHEMISTRY AND METABOLISM**

**CARBOHYDRATES:** Structure and properties of monosaccharide, disaccharides, oligosaccharides and polysaccharides, Metabolism of carbohydrates including glycolysis, HMP pathway, glyoxalate cycle, TCA cycle, Entner- Duodoroff pathway, gluconeogenesis, Pasteur effect.

**PROTEINS :** Outline of the structure of the common amino acids present in proteins, their general properties, metabolism of amino acids including deamination, transamination and decarboxylation, physical & chemical properties, classification and structure of proteins. Isolation, purification and estimation of proteins.

**NUCLEIC ACIDS:** Outline of the structure & functions of purine & pyrimidine bases, nucleosides and nucleotides, structure of nucleic acids.

**ENZYMES:** Nature, occurrence, classification of enzymes, outline of enzyme kinetics, competitive, non-competitive and uncompetitive inhibition, enzyme activity and importance of enzymes in fermentation industry

### **2. MICROBIOLOGY AND MICROBIAL GENETICS**

The microscope, spontaneous generation, biogenesis, fermentation, Microbial Diversity: Prokaryotes and Eukaryotes, Protozoa, Bacteria and Viruses, Bacterial size, shapes and pattern of arrangement, Structures external to cell wall: Flagella, Pili, Capsule, sheath, Prosthecae and stalk.

The cell wall structure: Gram positive and gram negative bacteria. Structures internal to cell wall: Cytoplasmic membrane, Cytoplasmic inclusion and nuclear material.

Reproduction and growth of bacteria & Yeast. Modes of cell division, Growth curve, Lag phase, Exponential phase, stationary phase and death phase, Nutritional requirements. Nutritional types of bacteria, Phototrophs, Chemotrophs, Autotrophs, Heterotrophs, Obligate parasites. Bacteriological media, Selective media, Maintenance media, Differential media. Control of microorganisms, Definitions and fundamentals of control, Physical agents / processes for control: high temperatures, low temperature, desiccation, osmotic pressure, radiation, filtration, host parasite interaction: pathogenicity, virulence and infection.

### **3. MOLECULAR BIOLOGY AND BASIC GENETIC ENGINEERING:**

Nature of the Gene, one gene one enzyme hypothesis, gene-protein relation, Genetic fine structure, Co-linearity of gene & protein, Inducible and constitutive operons

Manipulation of DNA: denaturation of DNA by heat, reassociation of complimentary strands.

### **4. ENVIRONMENTAL SCIENCES**

#### **1. Unit 1 Fundamental of Environmental Science**

Environment, Ecology, Ecosystem, Ecological Pyramids (Biomass/Number/Energy), Structure and Composition of Atmosphere, Hydrosphere, Lithosphere, Biosphere, Asthenosphere, Cryosphere, Anthroposphere, The Earth, Crust, Mantle And Core, Rock Cycle, Igneous, Metamorphic and Sedimentary, Biome, Agroclimatic Zones, Biogeographic Zones, Ecosensitive Zones, Ecological Indicators, Biogeochemical Cycles, Ecological Succession, Ecosystem Services, Environmental Sustainability, Environmental Management, Concept of 3 'R' and 5 'R', Ecotourism, Environmental Movements.

#### **2. Unit 2 Natural Resources Management and Global Environmental Issues**

Natural Resources: Classification and Global Distribution, Water Resources Management, Land Degradation, Mineral Resources Management, Forest Resource Management, Forest Restoration, Biodiversity Conservation, Wildlife Management, Energy Resources Management, Climate Change & Meteorology, Paleoclimatology, Green House Effect, Acid Rain, El Nino, La Nina, Ozone Depletion, Deforestation, Desertification, Desalination, Earth Summit, Kyoto Protocol, Montreal Protocol, Diatoms, Carbon Sequestration, Black Carbon, Economic Corridors, Asian Brown Cloud, Policies and

Technologies to reduce impacts of Climate Change on Antarctic (South Pole), Arctic (North Pole), Southern Ocean and Indian Himalayas. COP, IPCC, UNEP, UNDP, UNESCO World Heritage (Natural/Cultural) Sites, Environmental Hazards & Disasters

### **3. Unit-3 Instrumentation & Biostatistics**

Microscopy, Atomic Absorption Spectrophotometer, ICPMS, Flame Photometer, Sound Level Meter, pH Meter, Stack Monitoring Kit, Electrophoresis, Piezometer, Chromatography, Respirable Dust Sampler (RDS), High Volume Sampler (HVS), Fine particulate sampler (PM<sub>2.5</sub>, Ultrafine), CO analyzer, Waste Water Treatment Plant (WWTP), Effluent Treatment Plant (ETP), Sewage Treatment Plant (STP), Innovation and Entrepreneurship in Environmental Science, Data Collection, Sampling Methods, SPSS, Probability, Mean, Arithmetic Mean, Geometric Mean, harmonic mean, Median, Mode, Central Tendency, Standard Deviation, T-Test, F-Test, Chi-Square Test, Analysis of Variance, ANOVA, Correlation and Regression.

### **4. Unit-4 Environmental Legislation and Environmental Impact Assessment**

Water (Prevention and Control of Pollution) Act-1974, Environmental Protection Act-1986. Hazardous Waste (Management and Handling) Rule 1989, Biomedical Waste (Management and Handling) Rule-1998, Wild Life Protection Act-1972, Biodiversity Act-2002, Indian Forest Act-1972, Forest Conservation Act-1980, Disaster Management Act 2005, National Green Tribunal Act-2010, Air (Prevention and Control of Pollution) Act-1981, Noise Pollution (Regulation and Control Rules-2000, Environmental Impact Assessment: Introduction, Concept, Significance, Strategic Environmental Assessment, TOR, EAC & SEAC, Methods of EIA, Life Cycle Assessment, EMS Standard: ISO 14000 Series, Environmental Audit, Waste Audit, Cost Benefit Analysis, Environmental Design, Ecomark, Eco- Labelling, Occupational health and Industrial safety norms

### **5. Unit-5 Green Technologies for Environmental Pollution Control**

Green Energy, Solar Energy, Green Hydrogen, Fossil Fuels, Coal, Petroleum, Natural Gas, CNG, PNG, Bioenergy, Wind Energy, Chemical Energy, Magneto Hydro Dynamic (MHD) Power Generation, Biofuels, Ocean Energy, Geothermal Energy, Nuclear Energy, Environmental Isotopes, Environmental pollution (Air/ Water/ Soil/ Noise):Types, Causes, Effects, Monitoring and Management, Chemistry of (Air/Ozone/Water/Soil) AQI, Marine Pollution, Water Chemistry, WQI, Radioactive Pollution, Space Pollution, Environmental Standards, Water Quality Monitoring Parameters (Physical/Chemical/Biological), Ecotoxicology, Application of RS/ GIS/ GPS in Environmental Managements, Artificial Intelligence & Machine Learning in Environmental Modelling, Environmental Microbiology & Environmental Biotechnology, Bioremediation, Phytoremediation, Solid Waste Management, Hazardous Waste Management, Biomedical Waste, e Waste Management, Plastic Waste Management.

***Question paper will consist of two sections i.e. Chemistry (weightage 50%) and Environmental Sciences / Biotechnology (weightage 50%). Each section will be of equal marks. The questions will be of objective type and the candidate should attend all the questions.***

# SYLLABUS FOR ENTRANCE EXAMINATION

## SUGAR BOILING CERTIFICATE COURSE (SBCC) - 2026

### PAN BOILING PROCESS (SECTION-A)

1. General idea about various raw materials and crops for Sugar Manufacture, their cultivation, production etc.
2. General information about the equipment & Machinery installed in mill and Boiling House.
3. An overview of the Working, Types and Design of Equipment's used for sugar manufacture:(from Milling to Sugar Bagging).
4. Basic of Steam , Vapor bleeding etc,
5. Basics of the Process of vacuum pan boiling, Types and Grades of Sugar Produced, Boiling Schemes, Massecurites, Molasses their purities, Brixes, Grain Sizes etc. Understanding of Intermediate materials Colour Balance ICUMSA value. Crystal Measurement by use of microscope /crystallograph. Importance of Molasses Conditioning.
6. Preparation of A massecurite, B massecurite & C massecurite or R1, R2, & R3 etc. massecurites. Pharma Grade massecurite & Sugar grades.
7. Methods of slurry preparation, False grain & conglomerates. Different instruments Used in Vacuum Pan control and their Designs. Understanding & Calculation & its practical importance of Exhaustion% & Crystal Yield%, Basic knowledge of Cobenges formula.
8. Different types of Vacuum Pans used in the sugar industry, their parts, connections, etc.
9. Comparison between batch pan & Continuous pan.
10. Details of Vacuum Generation, Temperatures and Vacuum in Pans and Evaporators, usage of Condensate etc. Understanding of Cooling & condensing system & its Automation.
11. General Idea about the Working and designs of Crystallizers, Centrifugal, Grader etc. FBD+Rotary drier+Dehumidifier.

### MATHEMATICS & SCIENCE (SECTION -B)

1. Basics of Percentage, Fractions, Simple Interest, Compound Interest, Work – Time and Speed calculations.
2. Surface Area and Volume of different shapes such as Triangle, Rectangle, Trapezium cuboids, cylinder, cone, sphere etc.
3. Fundamental and secondary units and their conversion related to Weight, Time, Length, Area, Volume, Temperature etc.
4. General Information about pressure, temperature, Volume of Gases, Gas laws, Law of diffusion, Rate of diffusion, Atmospheric pressure and its effects.
5. Laws of Force, Motion, Work, Energy, Momentum, Torque, Couple etc.
6. Evaporation, Boiling point, Freezing point, Melting point, Elevation of Boiling point, Depression of Freezing point, , Temperature Scales, Principle of Calorimeter etc.

***Question paper shall consist of two sections i.e. Pan Boiling Process and Mathematics & Science. Each section will be of equal marks. The questions will be of objective type and the candidate should attend all the questions.***

# ***SYLLABUS FOR ENTRANCE EXAMINATION***

***CERTIFICATE COURSE IN QUALITY CONTROL (CCQC) - 2026***

## **MATHEMATICS (SECTION -A)**

### **1. Algebra:-**

Logarithms – Properties of logarithms

Complex Number, Geometrical representation of a complex number

Polynomials, Zeroes of quadratic equation, Factor Theorem, Remainder theorem, Relationship between zeroes and coefficients of quadratic polynomials,

Simple problems of arithmetic, geometric & harmonic progression, Partial Fractions

### **2. Trigonometry:-**

Trigonometrical Identities, Trigonometrical Equations, Relation between sides and angles of a triangle, Heron's Formula, Simple problems on height and distance

### **3. Coordinate Geometry:-**

Basic concepts of points and their coordinates, slope & gradient of a line, angle between two lines, various forms of equation of lines, distance of a point from a line, distance between parallel lines. Conic sections, circle, ellipse, parabola, hyperbola and their properties.

### **4. Statistics:-**

Estimation of mean, median & mode. Graphical Presentation of Data, Simple problems on finding the probability of an event

## **CHEMISTRY (SECTION - B)**

**1. Basic concepts of chemistry:-** Properties of matter & their measurements, Dalton's atomic theory, laws of chemical combination, Avogadro's Hypothesis, Atoms & Molecules, chemical equivalents, volumetric and gravimetric calculation, empirical & molecular formula. Electro chemistry, with special reference to pH and conductivity measurement, theory of solutions with special reference to solubility and solubility products, common ion effect.

**2. Surface Chemistry:-** Adsorption, application of absorption, colloidal state, emulsions & chromatography.

**3. Chemical Kinetics:-** Rate of affecting rate of reaction, dependence of rate of reaction on concentration, order and molecularity of chemical reaction, factors of a reactions.

**4. Organic Chemistry & Organic compounds:-** Detection of elements in organic compounds (qualitative analysis), estimation of elements in organic compounds (quantitative analysis), Calculation of empirical & molecular formula, General concept, mono, di and oligosaccharides, Reducing and Invert sugars, Specific rotations, Polarization, Polaroids. Refractrometry and Hygrometry

***Question paper will consist of two sections i.e. Mathematics and Chemistry. Each section will be of equal marks. The questions will be of objective type and the candidate should attend all the questions.***