

SYLLABUS

Saurashtra University



DDU Kaushal Kendra Curriculum for **BACHELOR of VOCATION** in **CHEMICAL TECHNOLOGY**

(Under UGC – DDU Kaushal Kendra sanctioned to Shree Manibhai Virani & Smt.
Navalben Virani Science College-Rajkot)

(Sanction Letter No. 3-43/2015(KAUSHAL) dated 14.08.2015)

B.Voc. - Chemical Technology

Semester I & II

Credit Based Semester System (CBSS)
Effective from June 2015-16

Bachelor of Vocation – Chemical Technology (3 years – Six Semester Full Time Course)

DEEN DAYAL UPADHYAY KAUSHAL KENDRAS

(XII plan guidelines for Deen Dayal Upadhyay Centres for knowledge acquisition and upgradation of skilled human abilities and livelihood (KAUSHAL) in universities and colleges -2014 - 2017)

Introduction:

Education plays an important role in the overall development of a human being as well as the nation. It is a unique investment in the present and for the future. Every country develops its own system of education to express and promote its unique socio-cultural identity besides meeting the challenges of time to leverage the existing potential opportunities. India, at present, is recognized as one of the youngest nations of the world with over 50% of population under the age of 30 years. It is estimated that by 2025, India will have 25% of the world's total workforce. In order to harness the full demographic dividend, India needs high quality educational system which is affordable, flexible and relevant to the individuals, as well as to needs of the society as a whole. Today, the country faces a demand – supply mismatch as the economy needs more 'skilled' workforce as also the managers and entrepreneurs than produced annually. In fact, majority of the contemporary institutions of higher learning remain almost disconnected with the requirements of the workplace. The higher education system has to incorporate the requirements of various industries in its curriculum, in an innovative and flexible manner while producing well groomed graduates. UGC introduced two schemes known as – Community Colleges and B.Voc. Degree Program in universities and colleges during the XII Plan. However, there is a need for taking integrated initiatives towards knowledge acquisition and up-gradation of skilled human competencies in universities and colleges to address the emerging needs of the economy so as to ensure that the graduates have adequate knowledge and skills to get appropriately employed or become entrepreneurs and, thereby, meet the economic and industrial needs at the regional and national level. Government of India, taking note of the requirement for skill development among students developed National Vocational Education Qualification Framework (NVEQF) which was later on assimilated into National Skills Qualifications Framework (NSQF). Various Sector Skill Councils (SSCs) are developing Qualification Packs (QPs), National Occupational Standards (NOSs) and assessment mechanisms in their respective domains, in alignment with the needs of the industry.

In view of this, the UGC implemented the scheme of Community Colleges from 2013-14 in pilot mode on the initiative of the MHRD. However, realizing the importance and the necessity for developing skills among students, and creating work ready manpower on large scale, the Commission decided to implement the scheme of Community Colleges as one of its independent schemes from the year 2014-15. The Commission also launched another scheme of B.Voc. Degree program to expand the scope of vocational education and also to provide vertical mobility to the students admitted into Community Colleges for Diploma programs to a degree program in the

Universities and Colleges. While these two schemes are being implemented, it is also realized that there is a need to give further push to vocational education on a even larger scale. It is therefore proposed to establish as many as 100 'Deen Dayal Upadhyay Centres for Knowledge Acquisition and Up gradation of Skilled Human Abilities and Livelihood (KAUSHAL)' during the XII Plan period. These Centers would take-up the vocational education to new levels and offer courses beyond B.Voc. degree also. These Centres would also embed and follow the guiding principles of NSQF, QPs, and NOSs for their programs and would not focus on skilling alone but also develop entrepreneurship traits. The Centres may endeavor to maintain a pyramidal structure of student enrolment with respect to Diploma, Advanced Diploma, B.Voc. and further studies.

Objectives of the Scheme:

The main objectives of these centers are to:

- a) create skilled manpower for industry requirements at various levels. The scheme provides for vertical mobility from short term certificate courses to full-fledged post graduate degree program, and further research in specialized areas. The courses would be planned/ designed to have provision of multiple entry and exit at various levels culminating up-to a research degree level. These shall also include courses which are offered under the Community College Scheme and B.Voc. degree program of UGC.
- b) Formulate courses at postgraduate level keeping in mind the need of i) Industry in specialized areas; ii) Instructional design, curriculum design and contents in the areas of Skills Development; iii) Pedagogy, assessment for skills development education and training; iv) trained faculty in the areas of skill development; and v) Entrepreneurship; etc.
- c) work for coordination between the higher education system and industry to become a Centre of Excellence for skill development in specialized areas.
- d) network with other such centers and universities and colleges imparting vocational education under the scheme of Community Colleges and B.Voc degree program in their region and coordinate with them for targeted development of skill oriented education.
- e) undertake R&D in the areas related to skill education & development, entrepreneurship, employability, labour market trends etc. at the post-graduate and research level.
- f) act as finishing school by providing supplementary modular training programs so that a learner, irrespective of his/her training background, is made job ready with necessary work skills (soft, communication, ICT skills etc) and fill the gaps in the domain skills measured against QPs/NOSs.
- g) provide for Recognition of Prior Learning (RPL) framework for job roles at NSQF Level 4 onwards by conducting assessment and certification with respective Sector Skill Councils (SSCs) / Directorate General of Employment and Training (DGET).
- h) Maintain 'Labour Market Information' for respective regions in coordination with other government agencies and industry associations.
- i) develop and aggregate curriculum, content and learning materials for skills development in different sectors.

Basic Principles for Curriculum Design:

While formulating the curriculum under the scheme, the Centers may:

- a) follow credit based semester system;
- b) provide for provision for credit transfer across courses;
- c) ensure alignment of skill component with the QPs/NOSs of the relevant job roles based on the exit profiles of the students. The focus of skill development components should be to equip students with appropriate knowledge, practice and attitude, so as to make them work ready. The skill development components should be relevant to the industries as per their requirements;
- d) provide credits for practical work, apprenticeship, on the job training, and project work;
- e) provide multiple exit and entry points with provision for vertical and horizontal mobility;
- f) assess and certify the skill competence for the selected job roles through the respective SSCs / DGET;
- g) provide credits for general education component and skill component broadly in the ratio of 40 : 60. The general education will also include credits in communication skills, ICT skills, soft skills, critical thinking, problem solving, environmental studies and value education.
- h) review the courses periodically in accordance with the changing requirements of the industry and regional / national economic priorities.
- i) follow UGC guidelines for skill development courses at different levels specified under Community Colleges, B.Voc. degree program and as may be prescribed from time to time.

Programs and Curricula: (UGC guidelines for curricular aspects, assessment criteria and credit system in skill based vocational courses under national skills qualification framework (NSQF))

In order to make education relevant and to create 'industry fit' skilled workforce, the institutions recognized under Community Colleges / B.Voc Degree program, and Deen Dayal Upadhyay KAUSHAL Kendras offering skill based courses will have to be in constant dialogue with the industry and respective Sector Skill Council(s) so that they remain updated on the requirements of the workforce for the local economy. There will be credit-based modular programs, wherein banking of credits for skill and general education components shall be permitted so as to enable multiple exit and entry. This would enable the learner to seek employment after any level of Award and join back as and when feasible to upgrade her / his qualification / skill competency either to move higher in her / his job or in the higher educational system. This will also provide the learner an opportunity for vertical mobility to second year of B.Voc degree program after one year diploma and to third year of B.Voc degree program after a two year advanced diploma. The students may further move to masters and research degree programs (NSQF Level 8 – 10)

Degree of Bachelor of Vocation in Chemical Technology (B.Voc. – Chemical Technology) Degree Course

Ordinance, Regulations and Examination Scheme :

O.S. B.Voc.- Chem.Tech. – 1 :

Admission Eligibility: There may be three types of learners getting admission to first semester of skill based courses under NSQF:

Category – 1 : students already acquired NSQF certification Level 4 in a particular industry sector and opted admission in the skill based courses under NSQF in the institutions recognized under Community Colleges / B.Voc Degree program / DDU KAUSHAL Kendras in same trade with job role for which he / she was previously certified at school level.

Category – 2 : students who have acquired NSQF certification Level 4 but may like to change their trade and may enter into skill based courses in a different trade.

Category – 3 : students passed 10+2 examination with conventional schooling without any background of vocational training.

Candidate who have passed an equivalent examination from any other board or examining body and is seeking admission to the Bachelor of Vocation – Chemical Technology (B.Voc.- Chem.Tech.) course will be required to provide necessary eligibility certificate.

Lateral Entry :

Candidate seeking admission directly in third semester of Bachelor of Vocation – Chemical Technology (B.Voc.- Chem.Tech.) must have passed Examination of either Diploma in Chemical Engineering or Diploma in Pharmacy **OR** B.Sc./BE/B.Voc. first year (candidate has to take up Skill Bridge course- Theory & Practical during semester 3) from any UGC recognized University.

O.S. B.Voc.- Chem.Tech. – 2 :

The duration of the course will be of three full time academic years. No candidate will be allowed to join any other course or service simultaneously. The examination for the Bachelor of Vocation – Chemical Technology (B.Voc.- Chem.Tech.) course will be divided into six semesters.

Multi-level Exit :

Candidate will be eligible to receive Diploma(NSQF Level 5) after first 2 semesters and Advance Diploma (NSQF Level 6) after 4 semesters according to guidelines of UGC.

O.S. B.Voc.- Chem.Tech. – 3 ::

Subject to the provisions laid down in Ordinance O.S. B.Voc.- **Chem.Tech.**– 2, a candidate who has passed the B. Voc. semester I & II/ B. Voc. semester III & IV of this University and if there is a break in the studies for any reason and if there is a change in the courses from semester system to annual part Examination system, the candidate will be admitted to B.Voc. Part II / B.Voc. Part III and the marks/ credits obtained by the candidate in his previous examination of this University in B.Voc. semester I and II will be carried forward and the result of the B.Voc. Second/ Final Examination will be declared accordingly.

O.S. B.Voc.- Chem.Tech. – 4 :

No candidate will be admitted to any semester examination for Bachelor of Vocation – Chemical Technology (B.Voc.- Chem.Tech.) unless a student has put on at least 80% of the total lecture periods and practical periods in each subject in each semester.

O.S. B.Voc.- Chem.Tech. – 5 :

No candidate will be permitted to reappear at any semester examination, which he has already passed. The marks of successfully completed paper will be carrying forwarded for the award of class.

O.S. B.Voc.- Chem.Tech. – 6 :

There shall be an examination at the end of each semester to be known as Pre Diploma (first semester) examination, Diploma (second semester-NSQF Level-5) examination, Pre Advanced Diploma (third semester) examination, Advanced Diploma (fourth semester-NSQF Level-6) examination, Pre B.Voc. Degree (fifth semester) examination and B.Voc. Degree (sixth semester-NSQF Level-7) examination. At which a student shall appear in that portion of theory papers, practical and viva – voice if any, for which he has kept the semester in accordance with the regulations in this behalf.

A candidate whose term is not granted for what so ever reason shall be required to keep attendance for that semester or term when the relevant papers are actually taken at the college.

O.S. B.Voc.- Chem.Tech. – 7 :

Guidelines to keep term of B.Voc. Chem. Tech.;

A candidate will be permitted to continue his/her study up to the 4th semester examination without passing his/her previous semester examination.

A candidate can take admission to fifth (pre-ultimate) semester if he/she is failing in NOT more than two subjects of previous (1 to 4) semesters.

A candidate can take admission to Sixth (Ultimate/Final) Semester if he/she is not failing in more than two subjects of 5th Semester. Provided he/she should have cleared all 1 to 4 semester.

R.S.B.Voc.- Chem.Tech.

Standard of Passing

The standard of passing for Bachelor of Vocation – Chemical Technology (B.Voc.- Chem.Tech.) degree examination will be as under :

- 1) To pass any semester examination of the Bachelor of Vocation – Chemical Technology (B.Voc.- Chem.Tech.) degree, a candidate must obtain at least 40% marks in the University examination separately in each course of theory and practical.
- 2) Total marks of each theory paper are 100 (External examination 70 marks + Internal examination 30 marks)
- 3) No internal examination marks in practical and project-viva papers.
- 4) Total marks of Entrepreneurship Development & Soft skill Training is 100. This subject will be evaluated either orally &/or practically on the basis of Project report submitted by the student.
- 5) Those of the successful candidates who obtain 50% or more marks in the aggregate of all the semester taken together will be placed in the Second class and those who obtain 60% or more marks in the aggregate of all the semester taken together will be placed in the First class. The successful candidates who obtain 70% or more marks in the aggregate of all the semester taken together will be declared to have passed the examination in the First class with Distinction.
- 6) A result of candidate who have obtained admission directly in Bachelor of Vocation – Chemical Technology (B.Voc.- Chem.Tech.) semester – III will be declared by considering his marks of semester III to VI in aggregate and accordingly class will be awarded as per normal percentage of marks fixed for other candidate.

B.Voc. Chemical Technology

Name of the Program(s) (Diploma, Adv. Diploma, Degree)	Semesters	No. of Credits 30 Cr./Sem	Job Roles and NSQF -Levels
Diploma in Surface Coating	1	60 Credits	NSQF Level 5 Supervisor
	2		
Advance Diploma in Petrochemicals & Polymers	3	60 Credits	NSQF Level 6 Technician / Trainer
	4		
B.Voc. in Chemical Technology	5	60 Credits	NSQF Level 7 B.Voc. Graduate
	6		

Note: A student has to earn additional 1 credit per year for Universal Human Value Education Course.

**B.Voc. Chemical Technology
Semester-I**

S.N.	Paper No.	Subject	Credit	Marks
1.	BVCT-101	Fundamental Chemistry-I	3	100
2.	BVCT-102	Fundamental Industrial Chemistry-I	3	100
3.	BVCT-103	Elementary Physics & Mathematics	3	100
4.	BVCT-104	Functional English & Office Automation Tools (OAT)-1	3	100
5.	BVCT-105	Practicals-1, 2, 3(Physics) & 4(OAT)	18	300
Total Credit Semester-I			30	700

**B.Voc. Chemical Technology
Semester-II**

S.N.	Paper No.	Subject	Credit	Marks
1.	BVCT-201	Analytical & Electro Chemistry	3	100
2.	BVCT-202	Chemistry of Surfactants	3	100
3.	BVCT-203	Surface Coating Techniques	3	100
4.	BVCT-204	Functional English & Office Automation Tools (OAT)-2	3	100
5.	BVCT-205	Training/ Project Report	3	150
6.	BVCT-206	Practicals-1, 2, 3 & 4(OAT)	15	250
Total Credit Semester -II			30	800

**B.Voc. Chemical Technology
Semester-III**

S.N.	Paper No.	Subject	Credit	Marks
1.	BVCT-301	Fundamental Chemistry-II	3	100
2.	BVCT-302	Fundamental Industrial Chemistry-II	3	100
3.	BVCT-303	Industrial Unit Process & Operations	3	100
4.	BVCT-304	Water Analysis	3	100
5.	BVCT-305	Practicals-1,2,3 & 4	18	300
Total Credit Semester -III			30	700

**B.Voc. Chemical Technology
Semester-IV**

S.N.	Paper No.	Subject	Credit	Marks
1.	BVCT-401	Petroleum & Petrochemicals	3	100
2.	BVCT-402	Chemistry of Polymer & Composite materials	3	100
3.	BVCT-403	Polymer Technology	3	100
4.	BVCT-404	Petroleum Analysis	3	100
5.	BVCT-405	Training/ Project Report	3	150
6.	BVCT-406	Practicals-2,3 & 4	15	250
Total Credit Semester -IV			30	800

**B.Voc. Chemical Technology
Semester-V**

S.N.	Paper No.	Subject	Credit	Marks
1.	BVCT-501	Stereo Chemistry & Organic reaction Mechanism	3	100
2.	BVCT-502	Biochemistry	3	100
3.	BVCT-503	MAT- Modern Analytical Techniques	3	100
4.	BVCT-504	Pharmaceutical (Medicinal) Chemistry	3	100
5.	BVCT-505	Practicals-1,2,3 & 4	18	300
Total Credit Semester -V			30	700

**B.Voc. Chemical Technology
Semester-VI**

S.N.	Paper No.	Subject	Credit	Marks
1.	BVCT-601	Pharmaceutical Engineering	3	100
2.	BVCT-602	Pharmaceutical Technology	3	100
3.	BVCT-603	Industrial Formulation & GLP	3	100
4.	BVCT-604	Entrepreneurship Development & Soft Skill Training	3	100
5.	BVCT-605	In plant Training/Project Report	3	150
6.	BVCT-606	Practicals-1, 2 &3	15	250
Total Credit Semester -VI			30	800

Saurashtra University
B. Voc. Chemical Technology
SEMESTER I
BVCT-101: Fundamental chemistry-1

Unit-I: Inorganic Chemistry

1. Atomic Structure and properties:

The atomic concept, Electromagnetic radiation and quantization, wave-particle duality of light, The shapes of atomic orbital,

2. Atomic properties and periodicity: Explanation and General Trends of the following Periodic Properties (a) Atomic and Ionic Radii (b) Ionization Potential (c) Electro negativity (d) Electron affinity

3. Theory of qualitative inorganic analysis: Factors affecting qualitative analysis: common ion effect, solubility product (k_{sp}) Use of NH₄Cl and NH₄OH in Qualitative Analysis Use of HCl and H₂S in Qualitative Analysis, Numerical on common ion effect and k_{sp}, Necessary explanation with chemical equations in (a) Charcoal test (b) Cobalt nitrate test (c) Borax bead test (d) Flame test.

Unit-II: Organic Chemistry

1. Electronic structure and Bonding:

Drawing Organic molecules, Ionic, Covalent and Polar Bonds, Functional groups, Inductive effect, resonance and hyper conjugation.

2. Acid & Bases: Bronsted-Lowry acid and bases, strengths of acid and bases, buffer solution, PH, Indicators, Lewis acid and bases, acidic and basic oxides

3. Theory of Qualitative organic analysis: Preliminary test, element determination test, functional group test, derivatisation

Unit-III: Physical Chemistry

1. Solution and their Properties: solutions, energy changes and the solution process, units of concentration, factors affecting solubility, colligative properties, vapour-pressure lowering of solution: Rault's law, boiling point elevation and freezing point depression of solutions, osmosis, fractional distillation of liquid mixture

2. Thermodynamics: Enthalpy, Entropy, entropy and second law of thermodynamics, free energy and equilibrium

Reference Books

1. Chemistry³ – Bullos-Holman-Parsons-Piling-Price.
2. Chemistry-McMurry Fay
3. Organic Chemistry-J. Clayden
4. Organic Chemistry-P.Bruice

Saurashtra University
B. Voc. Chemical Technology
SEMESTER I
BVCT-102: Fundamental Industrial Chemistry-1

- 1. Instrumentation for measurement of Industrial parameters:**
Introduction, Functions of measuring instruments, Types of measurement, Elements of an instrument, Classification of measuring instrument, Characteristics of an instrument.
- 2. Temperature Measurement:**
Introduction, Principle, Construction and Working of various types of Industrial Temperature measuring Instruments: Constant volume gas thermometer, Glass thermometer, Bimetallic thermometer, Pressure spring thermometer, Vapor actuated thermometer, Pneumatic balance pressure thermometer, Resistance thermometer, Industrial resistance thermometer bulbs (RT bulbs), Radiation temperature measurements, Laws of radiation, Radiation pyrometers, Vacuum thermocouple, Balometer, Photoelectric pyrometer, Optical pyrometer,
- 3. Viscosity Measurement:**
Introduction, Principle, Construction and Working of various types of Industrial Viscosity measuring Instruments: Capillary Viscometer, Orifice type viscometer, Falling sphere viscometer, Rotational viscometer,
- 4. Pressure Measurement:**
Introduction, Principle, Construction and Working of various types of Industrial Pressure measuring Instruments: Liquid column manometer, U-tube manometer, Inclined manometer, Well type manometer, Ring type manometer, Barometer, Bourdon gauge, Bellow gauge, McLeod gauge, Thermal conductivity gauge, Pirani gauge, Thermocouple gauge, Measuring pressure in corrosive fluids: Single coil siphon, Diaphragm seal, Liquid seal.
- 5. Liquid Level Measurement:**
Introduction, Principle, Construction and Working of various types of Industrial Liquid Level measuring Instruments: Methods of liquid level measurement, Hook type level indicator, Sight glass, Float type level indicator, Pressure gauge method: Bubbler system, Diaphragm box system, Air-trap system, Radiation level indicator, Ultrasonic method for level measurement,
- 6. Density Measurement:**
Introduction, Principle, Construction and Working of various types of Industrial Density measuring Instruments: Liquid level method of measuring specific gravity or density, Displacement meter for measuring specific gravity or density, Hydrometer,
- 7. Flow Measurement:**
Introduction, Principle, Construction and Working of various types of Industrial Flow measuring Instruments such as venturimeter, orificemeter, pitot tube.

Reference Books

1. Industrial instrumentation by D.P. Eckman, John – Wiley's and sons.
2. Applied instrumentation in process industries, Volume I, II, & III, W.G.Andrews, Gulf publication.
3. Instrumentation and control for the process industries by S. Borer, Elsevireapplied science publisher.
4. Chemical engineers handbook, by J.H. Perry and D. Green, McGraw Hillpublishing company, New York.
5. Industrial chemistry by B.K. Sharma, Goel Publishers, New Delhi.

Saurashtra University

B. Voc. Chemical Technology

SEMESTER I

BVCT-103: Elementary Physics and Mathematics

A. Elementary Physics

1. Basics of Electricity and Electronic

Electricity :- Ohm's Law and Concept of Resistance , Series and Parallel Connections of Resistance , e.m.f. , internal resistance and terminal Voltage of cell , Whetstone Bridge and Potentiometer circuit

Electronic: - Introduction to PN Junction Diode, LED and Photo Diode, Basics of Transistor and characteristics of transistor

2. Fundamental of Optics

Ray optics: - Laws of reflection and mirror formula , Laws of refraction , change in height, depth, Image formation by lenses and Lens formula

Wave optics: - Interference. Young's experiment and condition of constructive and destructive interference, introduction to diffraction and polarization

3. Properties of Matter: -

Solid Mechanics: - Introduction to different elastics constant, Practical applications of elasticity, Fluid Mechanics: - Pascal Law and hydraulic lift, Viscosity and stock's law and terminal velocity, Molecular interpretation of surface tension

4. Basics of Electromagnetism: -

Electrostatic Concept of electric field and potential, electric field and potential due to dipole, Electrical flux and Gauss law for electrical flux with application, Capacitor and capacitance, combination of capacitors and energy stored in capacitor

Magnetism :- Bar Magnet and field of Bar magnet , Classifications of materials on base of their magnetic properties

B. Elementary Mathematics

1. Elementary functions: Concepts, Trigonometric functions, Inverse trigonometric functions, Trigonometric relations, The exponential function, The logarithmic function, Values of exponential and logarithmic functions

2. Basics of Calculus:

Differentiation: Concepts, The process of differentiation, Continuity, Limits, Differentiation from first principles, Differentiation by rule, Implicit functions

Integration: Concepts, The indefinite integral, The definite integral, The integral calculus,

Uses of the integral calculus, Exercises

3. Vectors: Concepts, Vector algebra, Components of vectors, Scalar differentiation of a vector, The scalar (dot) product, The vector (cross) product, Exercises

4. Numerical & Statistical Methods: Concepts, Errors, Interpolation, Methods in linear algebra (Gauss elimination for the solution of linear equations, Gauss-Jordan elimination for the inverse of a matrix), Descriptive statistics (Mean, median, mode), Variance and standard deviation

Reference Books

Oxford University The Chemistry Maths Book PAGES-718-Second Edition Erich Steiner

Saurashtra University
B. Voc. Chemical Technology
SEMESTER I

BVCT-104: Functional English & Office Automation Tool (OAT)-1

A. Functional English - 1

Grammar

- 1. Determiners**
- 2. Tenses:** Defining a Verb, Chief forms of a Verb, Tense and Time, Further Division The Present Tense, The Past Tense, The Future Tense
- 3. Active – Passive Voice:** Introduction, Defining the Voice, Some General rules regarding the change of voice
- 4. Modals & Auxiliaries:** Introduction to Auxiliaries, The Primary Auxiliaries, Introduction to Modals, The Most Commonly used Modals, Important points about the Modals, Modals and Their Uses, prepositions / Prepositional Phrases

Writing Comprehension

- 1. Business Letters:** Introduction, Functions of a Business Letter, Inward Structure / Layout of a Business Letter, Other Important Parts of Business Letter, Outward appearance of a business letter, Arrangement Style, Salient Features of a Business Letter, Legal Aspects of a business Letters, Kinds of Business Letter, Inquiry & Reply Order & Reply Cancellation of order Complaint / Adjustment Sales Letter
- 2. Report Writing:** Introduction, The Nature of a Report, The P's of an Effective Report
- 3. Functions of a Report, Preparing a Report, Types of Reports, Business report, Press report**
- 4. Job Application / Resume Writing.** Introduction, A Cover Letter, Curriculum Vitae / Resume, Letters of Appointment & Resignation.

B. Office Automation Tools- OAT-1

1. Introduction to MS Word:

Introduction to word, the word window, Create a new document, Save, open and print document, Editing document, Formatting a Document, Insert elements to word document (Insert and delete page break, Insert page numbers, Insert symbols, Insert Shapes, Clip art, Insert picture, resize and reposition a picture), Changing Layout of document (Adjust page margin & page size, Change page orientation, Set and change indentation, Insert and clear tabs), Working with Tables (Insert a table, Navigate and select text in a table, Resize parts of a table. Align text in a table, Format a table, Insert and delete columns and rows, Borders and shading, Merge table cells), Mail Merge, Spelling and grammar check, Auto correct

2. Internet:

Introduction to Internet, Use of Internet, Applications of Internet, World wide web (web page, web site, web client and web server), Web browsers, Search engines, Email, Blogs and forums, Social media and chatting, Bookmarks, Internet Search, Basic search, Tips and Tricks for search, How to download and upload?

Reference Books

1. Windows-98 6 in 1 Practice Hall Publications.
2. BC of Word 97 by BPB Publication.
3. Computer Fundamentals P.K. Sinha by BPB Publication.
4. Internet-An Introduction, TATA McGraw Hill Publication.
5. High School English Grammar and Composition , Wren & Martin
6. Anthology of English language and communication skills, Sharma S R, Jacob John
7. Handbook of practical communication skills, Jaico Publication
8. Language and communication skills, Shastri, Rameshchandra

B. Voc. Chemical Technology

LABORATORY COURSE

SEMESTER - I

BVCT: 105 PRACTICAL

Laboratory course of B.Voc - Chemical Technology includes practical based on following subjects.

- Fundamental Chemistry-1
- Fundamental Industrial Chemistry-1
- Elementary Physics
- Office Automation Tool (OAT)-1

Saurashtra University
B. Voc. Chemical Technology
SEMESTER II
BVCT-201: Analytical & Electro Chemistry

- 1. Formulas, Equations and moles:**
Balancing chemical equations, Avogadro's number and the mole concept, Stoichiometric Calculations, yields of chemical reactions, Concentration Concept with Numerical: Preparation and standardization of Solutions (1° & 2°), Equivalent weight of acid and base, Equivalent weight of acid salt, an ion, Molarity with numerical, Normality with numerical, Molality with numerical, Strength of solutions, % concentration w/v & v/v, Formality.
- 2. Theory of quantitative analysis:**
Volumetric &, Gravimetric analysis: Introduction, types, theory, indicators and applications.
- 3. Pharma Analytical Chemistry:** Statistical Data Analysis: (a) Types of errors (b) Accuracy & precision (c) Data processing (d) Confidence limit & interval (e) Test of significance (f) t-test & F-test (g) Rejection of data (h) Control charts (i) Least square analysis (j) related problems
Sample handling, RM-CRM, COA, Importance of Documentation.
- 4. Electro chemistry:** Introduction, reversible and irreversible cell, measurement of EMF of cells, free energy and EMF of a cell reaction, measurement of entropy and enthalpy changes from Emf data, thermodynamics of electrode and cell potentials – Nernst equation, standard electrode potential – its measurement, representation of electrochemical cell and cell reaction from single electrodes, type of electrodes, other reference electrodes, classification of electrochemical cells, chemical cell, concentration cell, magnitude of liquid junction potential, application of EMF measurement.
- 5. Electro-analytical methods:** Basics of electro-analytical methods
 - **Conductometry:** Introduction, Arrhenius ionic theory, conductivity of electrolytes, Conductance, factors affecting conductance, Kohlrausch law, conductivity cells, applications & advantages of conductometric titration.
 - **Potential and pH metric methods:** introduction, acid – base neutralization titration, redox titration, precipitation titration.

Books Recommended:

1. A textbook of physical chemistry – A. S. Negi, S. C. Anad.
2. Engineering chemistry - R. Gopalan, D. Venkappayya, S. Nagarajan.
3. Chemistry in engineering and technology volume -1 & 2 – J.C. Kuriacose & J. Rajaram
4. Engineering chemistry – Jain & Jain
5. Industrial hygiene and chemical safety – M. K. Fulekar.
6. Guidelines on GMP/GLP by S. Lyer.
7. Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West and F.J. Holler, W.B. Saunders.

Saurashtra University
B. Voc. Chemical Technology
SEMESTER II
BVCT-202: Chemistry of Surfactants

- 1. Chemistry of surfactants:** Introduction, definition & Fundamentals of Surfactants
- 2. Characteristic Features of Surfactants**
Interfacial Phenomena and Surfactants, general structural features and behaviour of surfactants, characteristic features and uses of commercially available surfactants, types of Surfactants (i.e. Anionics, Cationics, Nonionics, Zwitterionics), surfactants based upon renewable raw materials, environmental effects of surfactants.
- 3. Adsorption of Surface-Active Agents**
The Electrical Double Layer, Adsorption at the Solid–Liquid
- 4. Micelle Formation by Surfactants**
Micellar structure and shape, micellar structure and shape, factors affecting the value of the cmc in aqueous media, thermodynamic parameters of micellization.
- 5. Reduction of Surface and Interfacial Tension by Surfactants**
Efficiency in surface tension reduction, effectiveness in surface tension reduction, liquid–liquid interfacial tension reduction, dynamic surface tension reduction.
- 6. Application of surfactants**
Detergency and Its Modification, Emulsification, Foaming and Antifoaming, Wetting and Its Modification

Books Recommended:

1. Surfactants and interfacial phenomena - Milton J. Rosen
2. Chemical formulation an overview of surfactant – based preparation used in everyday life – Tony Hargreave
3. Industrial chemistry – B. K. Sharma.

Saurashtra University
B. Voc. Chemical Technology
SEMESTER II
BVCT-203: Surface Coating Techniques

1. **Surface coating:** Introduction, preliminary treatment of surfaces, objective of coating (on metal & non-metals), classification of surface coatings (inorganic & organic)
2. **Inorganic surface coating :** Anodic coating, cathodic coatings, hot dipping (galvanising, tinning), metal spraying, cementation, metal cladding, electroplating, anodising, vacuum metallizing, cathode sputtering, electrophoretic coating, surface conversions, vitreous coating.
3. **Electroplating:** Theory and electroplating techniques of nickel, chrome and silver.
4. **Characteristics of electro – deposit and factors affecting:** thickness, adherence, hardness, brightness, protective value, decorative value, throwing power, temperature, pH of the bath liquid etc.
5. **Organic surface coating:** oil paints, water paints (emulsion paints), varnishes, lacquers and wax polishes and special paints.

Books Recommended:

1. Engineering chemistry - R. Gopalan, D. Venkappayya, S. Nagarajan.
2. Chemistry in engineering and technology volume -1 & 2 – J.C. Kuriacose & J. Rajaram
3. Engineering chemistry – Jain & Jain
4. Industrial hygiene and chemical safety – M. K. fulekar.

Saurashtra University

B. Voc. Chemical Technology

SEMESTER II

BVCT-204: Functional English & Office Automation Tool (OAT)-2

A. Functional English-2

1. Conversation Skills

Conversations based on everyday situation / Dialogue, Writing, Introduction, Nature of Conversations, Purpose of conversation, Guidelines for Effective Conversation Skills, Proverbs used in Everyday Conversation with their Meanings / Explanations, Comparisons used in Everyday Conversation, Practical Conversations

2. Communication Skills

Communication – Meaning, Features & Process, Verbal & Non – Verbal comm., Verbal, Oral Communication, Written Communication, Non – Verbal, Body language, Space, Para language, Others, Group discussion skills: Meaning, Characteristic, Do's & Don'ts, Relevance, Moderating a group discussion, Presentation skills: Meaning, Planning a presentation skills, Preparing a presentation skills, Delivering a presentation skills, Presentation skills, Public Speaking: Meaning, Essential of effective public speaking, Facing Interviews: Importance, Do's & Don'ts

B. Office Automation Tools- OAT-2

1. Spread Sheet Using MS Excel

Sheet Introduction, Selecting row, column, cell, Inserting and deleting row, column, cell

Hide & unhide row & column, Changing height and width of row and column, Print Preview and Page Layout, Formula bar, Cell Referencing - Relative, Absolute, Mixed

Useful functions from Function Library, What if Analysis, Calculative Examples like salary sheet, mark sheet etc., Conditional formatting, Data sorting and Filter, Types of different chart & editing charts

2. Presentation Using MS Power Point

Inserting new slide, Different layout of slide, Inserting date, slide number, movie, sound, object, header and footer, Designing slide, Theme and background, Custom animation, Slide transition, Rehearse timings, Slide show, Setup slide show, Hide slide, Different views of slide, Use of slide master, Printing handout, slide, etc

Books Recommended:

1. Windows-98 6 in 1 Practice Hall Publications.
2. BC of Word 97 by BPB Publication.
3. ABC of Excel by BPB Publication.
4. Computer Fundamentals P.K. Sinha by BPB Publication.

5. High School English Grammar and Composition , Wren & Martin
6. Anthology of English language and communication skills, Sharma S R, Jacob John
7. Handbook of practical communication skills, Jaico Publication
8. Language and communication skills, Shastri, Rameshchandra

B. Voc. Chemical Technology

Training / Project Report (PR)

SEMESTER II

BVCT: 205 Training / Project Report

Training / Project Report based on following subjects:

- Analytical & Electro Chemistry
- Surfactants
- Surface Coating
- Unit Operations / Unit Processes

B. Voc. Chemical Technology

LABORATORY COURSE

SEMESTER II

BVCT: 206 PRACTICAL

Laboratory course of B.Voc - Chemical Technology includes practical based on following subjects:

- Analytical & Electro Chemistry
- Chemistry of Surfactants
- Surface Coating Techniques
- Office Automation Tool (OAT)-2

B. Voc. Chemical Technology

SEMESTER END UNIVERSITY EXAMINATION

THEORY QUESTION PAPER STYLE- Semester I & II

Time: 2:30 hrs

Theory- Total Marks-70

Que.:1 Objective type Q & A

- 30 Marks

SN	Type	No. of Que.	Weightage	Marks
I	MCQs	10	1 mark	10
II	MCQs	10	2 marks	20
Total				30 marks

Que.:2 Subjective type Q & A

- 20 Marks

Any **Four** out of Six Questions - Each carrying **5 marks**- Total- 20 marks

Que.:3 Subjective type Q & A

- 20 Marks

Any **Four** out of Six Questions - Each carrying **5 marks**- Total- 20 marks

PRACTICAL - Semester I	PRACTICAL - Semester II
Days: 02 Time: 6 hrs/day	Days: 03 Time: 6 hrs/day
Practical - 250 Marks Viva voce - 50 Marks	Practical - 200 Marks Viva voce - 50 Marks
	Training Report or Project Report - 100 marks Viva voce - 50 Marks

B. Voc. Chemical Technology

INTERNAL EVALUATION - THEORY

Semester I & II

Marks per Paper 30 marks

SN	Detail	Marks
1	MCQ – Objective test	10
2	Attendance & Theoretical Assignment/ Seminar	10
3	Theoretical &/or Practical Assignment	10
Total		30 marks

No Internal Evaluation for Practical & Project/Training Components