



॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड
'ज्ञानतीर्थ', विष्णुपुरी, नांदेड - ४३१ ६०६ (महाराष्ट्र राज्य) भारत
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA
Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accertified with 'B++' grade

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विद्यापीठ अनुदान आयोगाने शैक्षणिक वर्ष २०२०-२१ पासून मान्यता दिलेल्या बी. व्होक (व्होकेशनल कोर्सेसचे) पदवी तृतीय वर्षाचे अभ्यासक्रमाचे (Syllabus) शैक्षणिक वर्ष २०२२-२३ पासून लागू करणे बाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, विज्ञान व तंत्रज्ञान विद्याशाखेतील विद्यापीठ अनुदान आयोगाने शैक्षणिक वर्ष २०२०-२१ पासून मान्यता दिलेल्या बी. व्होक (व्होकेशनल कोर्सेसचे) पदवी अभ्यासक्रमाचे तृतीय वर्षाचे Syllabus शैक्षणिक वर्ष २०२२-२३ पासून लागू करण्यास मा. कुलगुरू महोदयांनी मा. विद्यापरिपदेच्या मान्यतेच्या अधीन राहून मान्यता दिलेली आहे. त्यानुसार खालील अभ्यासक्रम लागू करण्यात येत आहेत.

1. B. Voc Software Development III year
2. B. Voc. Bachelor of Medical Laboratory Technology. III year
3. B. Voc. Herbal Medicine III year
4. B. Voc. Agriculture/commercial Aquaculture III year
5. B. Voc. Horticulture and Post Harvest Technology III year
6. B. Voc. Food Processing /Food Processing Technology III year
7. B. Voc. Chemical & Petrochemical Applied Analytical Chemistry III year
8. B. Voc. Life Science/Skill Based Zoology III year

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या www.srtmun.ac.in या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी. ही विनंती.

जा.क्र.:शैक्षणिक-१/परिपत्रक/व्होकेशनल अभ्यासक्रम/N-

२०२२-२३/ 624

दिनांक : २९.०९.२०२२

प्रत माहिती व पुढील कार्यवाहीस्तव :

- १) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
- २) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- ३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
- ४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
- ५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
- ६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, सदरील परिपत्रक विद्यापीठाच्या संकेतस्थळावर प्रसिध्द करण्यात यावे.

(Signature)

सहाकुलसचिव

शैक्षणिक (१-अभ्यासमंडळ) विभाग

Swami Ramanand Teerth Marathwada
University, Nanded



Syllabus for the
Third Year Bachelor of Vocation Program
B.Voc.(Sem V & VI)

Faculty – Science & Technology

Course Title: “Chemical & Petrochemicals
Applied Analytical Chemistry”

(Credit Based Semester and Grading System with
effect from the academic year 2020–2021)

(UGC Recognized)

: Preamble:-

B.Voc. is introduced with the needs of the economy so as to ensure that the graduates of higher education system have adequate knowledge and skill for employment and entrepreneurship. The higher education system has to incorporate the requirements of various industries in its curriculum, in an innovative and flexible manner while developing a holistic and well-groomed graduate.

The University Grants Commission (UGC) has launched a scheme on skill development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Diploma / Advanced Diploma under the NSQF. The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles and their NOSs along with broad based general education. This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge.

Objectives

- To provide judicious mix of skills relating to a profession and appropriate content of General Education.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students coming out of 10+2 with vocational subjects.

Levels of Awards

The certification levels will lead to Diploma/Advanced Diploma/B. Voc. Degree in one or more vocational areas and will be offered under the aegis of the University. Award Duration Corresponding NSQF level

- Diploma 1 Year
- Advanced Diploma 2 Years
- B.Voc. Degree 3 Years

Eligibility and Fees for Admission in B.Voc.

The eligibility condition for admission to B.Voc. programme shall be 10+2 or equivalent, in any stream.

Syllabus for the Year: 2020 – 21

Sem. I	Paper No.	Course Number	Course Title	Hr/Week	Type of Course	Credits	Marks		Total
							ESA	CIA	
	General Education Component								
	Paper-I	CPAC-01	Communication Skills	4	GE	4	75	25	100
	Paper-II	CPAC - 02	Basic Computers	4	GE	4	75	25	100
	Paper-III	CPAC-03	Basics of Analytical Chemistry	4	GE	4	75	25	100
	Skill Courses								
	Paper-IV	CPAC-04	Laboratory Course-I	6	CC	6	100	50	150
	Paper-V	CPAC-05	Laboratory Course-II	6	CC	6	100	50	150
Paper-VI	CPAC-06	Laboratory Course-III	6	CC	6	100	50	150	
Sem. II	Paper No.	Course Number	Course Title	Hr/Week	Type of Course	Credits	Marks		Total
							ESA	CIA	
	General Education Component								
	Paper-VII	CPAC-07	Basic Organic Chemistry	4	GE	4	75	25	100
	Paper-VIII	CPAC-08	Miscellaneous Method of Analysis	4	GE	4	75	25	100
	Paper-IX	CPAC-09	Petrochemistry	4	GE	4	75	25	100
	Skill Courses								
	Paper-X	CPAC-10	Laboratory Course-IV	6	CC	6	100	50	150
	Paper-XI	CPAC-11	Laboratory Course-V	6	CC	6	100	50	150
Paper-XII	CPAC-12	Laboratory Course-VI	6	CC	6	100	50	150	
Sem. III	Paper No.	Course Number	Course Title	Hr/Week	Type of Course	Credits	Marks		Total
							ESA	CIA	
	General Education Component								
	Paper-XIX	CPAC-13	S & P block element	4	GE	4	75	25	100
	Paper-XX	CPAC-14	Methods of Analysis	4	GE	4	75	25	100

(B.Voc.) (Applied Analytical Chemistry)

	Paper-XXI	CPAC-15	Basics of Biochemistry	4	GE	4	75	25	100
	Skill Co urses								
	Paper-XXII	CPAC-16	Laboratory Course-VII	6	CC	6	100	50	150
	Paper-XXIII	CPAC-17	Laboratory Course-VIII	6	CC	6	100	50	150
	Paper-XXIV	CPAC-18	Laboratory Course-IX	6	CC	6	100	50	150
Sem. IV	Paper No.	Course Number	Course Title	Hr/Week	Type of Course	Credits	M arks		Total
							ESA	CIA	
	General Education Component								
	Paper-XXVIII	CPAC-19	d &f block element	4	GE	4	75	25	100
	Paper-XXIX	CPAC-20	Petrochemistry -II	4	GE	4	75	25	100
	Paper-XXX	CPAC-21	Method of Analysis	4	GE	4	75	25	25
	Skill Courses								
	Paper-XXXI	CPAC-22	Laboratory Course-X	6	CC	6	100	50	150
	Paper-XXXII	CPAC-23	Laboratory Course-XI	6	CC	6	100	50	150
	Paper-XXXIII	CPAC-24	Laboratory Course-XII	6	CC	6	100	50	150
Sem. V	Paper No.	Course Number	Course Title	Hr/Week	Type of Course	Credits	Marks		Total
							ESA	CIA	
	General Education Component								
	Paper-XXXVII	CPAC-25	Analytical spectroscopy	4	GE	4	75	25	100
	Paper-XXXVIII	CPAC-26	Analytical Instrumentation	4	GE	4	75	25	100
	Paper-XXXIX	CPAC-27	Petrochemistry-III	4	GE	4	75	25	25
	Skill Co urses								
	Paper-XXXX	CPAC-28	Laboratory Course-XIII	6	CC	6	100	50	150

	Paper-XXXXI	CPAC-29	Laboratory Course-XIV	6	CC	6	100	50	150
	Paper-XXXXII	CPAC-30	Laboratory Course-XV	6	CC	6	100	50	150
	Paper No.	Course Number	Course Title	Hr/Week	Type of Course	Credits	Marks		Total
							ESA	CIA	
	General Education Component								
Sem. VI	Paper-XXXXVI	CPAC-31	Production and Quality control	4	GE	4	75	25	100
	Paper-XXXXVII	CPAC-32	Human Resource Management	4	GE	4	75	25	100
	Paper-XXXXVIII	CPAC-33	Field Visit/ Industrial Visit	4	GE	4	--	100	100
	Skill Courses								
	Paper-XXXXIX	CPAC-34	Industrial Project at Chemical based Industries	-	CC	16	300	100	400
	Paper-XXXXX	CPAC-35	Report Writing	-	CC	2	25	25	50
	Paper-XXXXXI	CPAC-36	Seminar and Viva-Voce	-	CC	3	75	-	75

Note: Project/Industrial training and report writing is compulsory

Swami Ramanand Teerth Marathwada University, Nanded

Semester - V

Certificate, Diploma, Advanced Diploma and B.Voc Degree
(Chemical & Petrochemicals Applied Analytical Chemistry)

Third Year (Semester V) Semester Pattern

Paper-XXXVII: Analytical Spectroscopy (CPAC-25)

Maximum Marks: 100

Credits: 4

Periods: 45

Unit I:

Introduction of analytical spectroscopy: (08 Periods)

Unit II:

Feature selection and extraction : (08 Periods)

Unit III:

Plasma emission spectroscopy: (09 Periods)

Unit IV:

X-Ray Spectroscopy: (08 Periods)

Unit V:

Mossbauer spectroscopy (07 Periods)

Unit-VI:

Raman spectroscopy (05 Periods)

Reference Books: Analytical spectroscopy - Kamlesh Bansal

Swami Ramanand Teerth Marathwada University, Nanded

Certificate, Diploma, Advanced Diploma and B.Voc Degree

(Chemical & Petrochemicals Applied Analytical Chemistry)

Third Year (Semester V) Semester Pattern

Paper-XXXVIII Analytical Instrumentation (CPAC-26)

Maximum Marks: 100

Credits: 4

Periods-45

Unit I: Introduction

(10 Periods)

Analytical techniques and analytical method, method of chemical analysis, Separation technique used for analysis, Introduction to electrophoresis, Computer Operation:

Unit-II: Units of measurement

(10 Periods)

Concentration units, Quality standards

Unit III: Methods of calibration in instrumental analysis

(10 Periods)

Calibration curve method, standard addition method, internal standard method

Unit IV: Electroanalytical method of analysis:

(15 Periods)

- a) Potentiometry : Potential measurement
- b) Potentiometric measurement
- c) Instrumentation of potentiometric titration

Reference Books: Analytical instrumentation-chinttan

Swami Ramanand Teerth Marathwada University, Nanded

Certificate, Diploma, Advanced Diploma and B.Voc Degree

(Chemical & Petrochemicals Applied Analytical Chemistry) Third

Year (Semester V) Semester Pattern

Paper-XXXIX Petrochemistry-III (CPAC-27)

Maximum Marks: 100

Credits: 4

Periods-45

Unit-I: Introduction to Refining Processes

(10 Periods)

Introduction, Dewatering and Desalting, Distillation, Distillation at Atmospheric Pressure, Distillation under Reduced Pressure, Azeotropic and Extractive Distillation, Thermal Processes, Thermal Cracking, Visbreaking, Coking, Delayed Coking, Fluid Coking, Catalytic Processes, Catalytic Cracking, Catalysts, Hydroprocesses, Hydrotreating, Hydrofining, Hydrocracking. Reforming Processes, Thermal Reforming, Catalytic Reforming, Catalysts, Isomerization Processes, Processes, Catalysts, Alkylation Processes, Processes, Catalysts. Polymerization Processes, Processes Catalysts. Solvent Processes: Deasphalting, Dewaxing, Petroleum Products, Petrochemicals.

Unit-II: Solvent Processes:

(10 Periods)

Introduction, Deasphalting, Deasphalting Process Deep Solvent Deasphalting Process, Demex Process, MDS Process Residuum Oil Supercritical Extraction Process. Deasphalting Process: Lube Deasphalting, Dewaxing Processes, Cold Press, Solvent Dewaxing Process, Urea Dewaxing Process, Centrifuge Dewaxing Process, Catalytic Dewaxing Process, Dewaxing Heavy Feedstocks.

Unit-III: Product Improvement

(15 Periods)

Introduction, Thermal Reforming, Catalytic Reforming, Fixed-Bed Processes, Moving-Bed, Fluid-Bed Processes, Isomerization, Butamer, Butomerate Process, Hysomer Process, Iso-Kel Process, Isomate Process, Isomerate Process, Penex, Pentafining, Hydroisomerization, Alkylation, Sulfuric Acid Alkylation, Hydrogen Fluoride Alkylation, Polymerization, Thermal, Polymerization, Solid Phosphoric Acid Polymerization, Bulk Acid Polymerization, Catalysts Reforming Processes, Isomerization Processes, Alkylation Processes, Polymerization Processes, Treating Processes, Caustic Processes, Dualayer Distillate Process, Dualayer Gasoline Process, Electrolytic Mercaptan Process, Ferrocyanide Process, Lye Treatment, Mercapsol Process, Polysulfide Treatment, Sodalol Process, Solutizer Process, Steam-Regenerative Caustic Treatment, Unisol Process, Acid Processes: Nalfining Process & Sulfuric Acid Treatment, Clay Processes: Alkylation Effluent Treatment, Arosorb Process, Bauxite Treatment, Continuous Contact Filtration Process, Cyclic Adsorption Process, Gray Clay Treatment, Percolation Filtration Process, Thermoform Continuous Percolation Process, Oxidative Processes, Bender Process, Copper Sweetening Process, Doctor Process, Hypochlorite Sweetening Process, Inhibitor Sweetening Process, Merox Process, Solvent Processes.

Unit-IV: Hydrogen Production

(10 Periods)

Introduction, Processes Requiring Hydrogen, Hydrotreating, Hydrocracking, Hydrogen Production, Feedstocks, Chemistry, Catalysts. Reforming Catalysts, Shift Conversion Catalysts, Methanation Catalysts, Hydrogen Purification, Wet Scrubbing, Pressure Swing Adsorption Units, Membrane Systems, Cryogenic Separation, Hydrogen Management,

Commercial Processes, Heavy Residue Gasification and Combined, Cycle Power Generation, Hybrid Gasification, Hydrocarbon Gasification, Hypro Process, Pyrolysis Processes, Shell Gasification Process, Steam–Methane Reforming, Steam–Naphtha Reforming, Synthesis Gas Generation

Semester - V
Swami Ramanand Teerth Marathwada University, Nanded
Certificate, Diploma, Advanced Diploma and B.Voc Degree
(Chemical & Petrochemicals Applied Analytical Chemistry)
Third Year (Semester V) Semester Pattern
Paper-XXXX: Laboratory Course-XIII (CPAC-28)

Maximum Marks: 150

Credits: 6

Periods: 60

1. Calibration of volumetric apparatus: Pipette / Standard flask.
2. Preparation of standard solution of potassium hydrogen phthalate and standardization of sodium hydroxide solution
3. Assay of H_2O_2 solution
4. Determination of acetic acid content in a commercial sample of vinegar
5. Estimation of HCl and CH_3COOH in mixture using acid base indicators.
6. Estimation of iodine in the given solution using standard $\text{Na}_2\text{S}_2\text{O}_3$ solution.
7. Preparation of EDTA solution and its standardization using standard Zn^{++} solution.
8. Estimation of Al^{+++} in the given solution using standard EDTA solution (Back Titration)

Reference Books

1. Principles in semi-micro qualitative analysis: G. R. Chatwal edited by M. Arora.
2. Experiments in chemistry: D. V. Jahagirdar.
3. A text book of experimental and calculation in engineering chemistry: S. S. Dara.
4. Practical Chemistry (for B.Sc.I, II & III Year Students of All Indian Universities)
Dr. O.P. Pandey, D.N. Bajpai & Dr. S. Giri, S. Chand & Company, New Delhi.

Semester - V
Swami Ramanand Teerth Marathwada University, Nanded
Certificate, Diploma, Advanced Diploma and B.Voc Degree
(Chemical & Petrochemicals Applied Analytical Chemistry)
Third Year (Semester V) Semester Pattern
Paper-XXXXI: Laboratory Course-XIV (CPAC-29)

Maximum Marks: 150

Credits: 6

Periods: 60

- 1) Estimation of SiO_2 in the given sample of Portland cement.
- 2) Estimation CaO in the given sample of Portland cement by gravimetric method.
- 3) Determination of Iodine value of an oil sample.
- 4) Determination of specific gravity of an oil sample.
- 5) Determination of loss on ignition of Portland cement.
6. Determination of pK_a value of acid base indicator.
7. Photometric titration of copper by EDTA

Reference Books

1. Experiments in Chemistry by Dr. D.V. Jahagirdar.
2. Systematic experimental physical chemistry by Dr. Chondhekar T.K. and S.W. Rajbhoj.
3. Advanced practical inorganic chemistry by Gurdeep Raj.
4. Practical physical chemistry by J.B. Yadav.
5. Analytical chemistry by R.M. Verma.

Semester - V
Swami Ramanand Teerth Marathwada University, Nanded
Certificate, Diploma, Advanced Diploma and B.Voc Degree
(Chemical & Petrochemicals Applied Analytical Chemistry)
Third Year (Semester V) Semester Pattern
Paper-XXXXII: Laboratory Course-XV (CPAC-30)

Maximum Marks: 150

Credits: 6

Periods: 60

- 1 Determination of concentration of ferrous ion by potentiometric titration.
2. Iodometric determination of copper.
3. Estimation of ferrous and ferric iron in a mixture.
4. Determination of copper and Nickel in a mixture
5. Paper/Thin layer chromatography separation of metals/ amino acids / Sugars from a mixture
- 6.Determination of Capacity of cation exchange resin.
7. Determination of Capacity of anion exchange resin.

Reference Books

- 1.Experiments in Chemistry by Dr. D.V. Jahagirdar.
2. Systematic experimental physical chemistry by Dr. Chondhekar T.K. and S.W.Rajbhoj.
3. Advanced practical inorganic chemistry by Gurdeep Raj.
4. Practical physical chemistry by J.B. Yadav.
5. Analytical chemistry by R.M. Verma.

Semester - VI
Swami Ramanand Teerth Marathwada University, Nanded
Certificate, Diploma, Advanced Diploma and B.Voc Degree
(Chemical & Petrochemicals Applied Analytical Chemistry)
Third Year (Semester VI) Semester Pattern
Paper- XXXXVI: Production and Quality control (CPAC-31)

Maximum Marks: 100

Credits: 4

Periods: 45

Unit I : Introduction (09 Periods)
Production, Quality, Fundamental Factors Affecting Quality, Control ,Need for Controlling Quality.

Unit II : Inspection (09 Periods)
Objectives of Inspection, Purpose of Inspection, Types of Inspection, Methods of Inspection, Drawbacks of Inspection

Unit III : Quality Control (12 Periods)
Types of Quality Control, Steps in Quality Control, Objectives of Quality Control, Benefits of Quality Control, Seven Tools for Quality Control, Causes of Variation in Quality, Statistical Process Control.

Unit IV : Quality Circles (15 Periods)
Total Quality Management (TQM), 9 ISO 9000 Series, Application ISO 9000: ISO 14000 Series

Semester - VI
Swami Ramanand Teerth Marathwada University, Nanded
Certificate, Diploma, Advanced Diploma and B.Voc Degree
(Chemical & Petrochemicals Applied Analytical Chemistry)
Third Year (SemesterVI) Semester Pattern
Paper- XXXXVII: Human Resource Management (CPAC-32)

Maximum Marks: 100

Credits: 4

Periods: 45

Introduction:

Human Resource Management (HRM), Definition	(05 Periods)
Research Methodology, Corporate Social Responsibility and Business Ethics	(07 Periods)
Marketing Management	(05 Periods)
Production and Operations Management Economics of Human Resources	(07 Periods)
Managing Interpersonal and Group Processes Fundamentals of Industrial Relation	(07 Periods)
Compensation Benefits, Performance Management & Appraisal	(07 Periods)
Talent Management and Employee Relations, Change Management	(07 Periods)

Semester - VI
Swami Ramanand Teerth Marathwada University, Nanded
Certificate, Diploma, Advanced Diploma and B.Voc Degree
(Chemical & Petrochemicals Applied Analytical Chemistry)
Third Year (SemesterVI) Semester Pattern
Paper- XXXXVIII: Field Visit (CPAC-33)

Maximum Marks: 100

Credits: 4

Periods: 45

Field Visit/ Industrial Visit / Skill Development (Case Study)

Semester - VI
Swami Ramanand Teerth Marathwada University, Nanded
Certificate, Diploma, Advanced Diploma and B.Voc Degree
(Chemical & Petrochemicals Applied Analytical Chemistry)
Third Year (SemesterVI) Semester Pattern
Paper-XXXXIX: Industrial Project (CPAC-34)

Maximum Marks: 300

Credits: 16

Industrial Project at chemical base Industry

Industrial Projects: Industrial Projects includes power plants, steel plants, fertilizer plants, petrochemical and refineries, cement plants, aluminium plants etc.

Semester - VI
Swami Ramanand Teerth Marathwada University, Nanded
Certificate, Diploma, Advanced Diploma and B.Voc Degree
(Chemical & Petrochemicals Applied Analytical Chemistry)
Third Year (Semester VI) Semester Pattern
Paper-XXXXX: Report Writing (CPAC-35)

Maximum Marks: 50

Credits: 2

Report writing should done in proper manner

Steps in Project Report Writing

- Find a good role model or mentor
- Decide what you're going to say
- Plan the structure of your report
- Gather & sift any source information
- Respect intellectual property rights
- Create a draft report
- Engage readers by using writing techniques
- Assess & review your draft
- Final proofing
- Peer review & sign-off

Semester - VI
Swami Ramanand Teerth Marathwada University, Nanded
Certificate, Diploma, Advanced Diploma and B.Voc Degree
(Chemical & Petrochemicals Applied Analytical Chemistry)
Third Year (Semester VI) Semester Pattern
Paper-XXXXXI: Seminar & Viva-Voce (CPAC-36)

Maximum Marks: 75

Credits:3

Seminar and Viva –voce

(should be conducted in presence of Examiner)