MANONMANIAM SUNDARANAR UNIVERISTY,
TIRUNELVELI-12

SYLLABUS

UG - COURSES – AFFILIATED COLLEGES

Course Structure for B. Sc. Botany
(Choice Based Credit System)
(with effect from the academic year 2024-2025 onwards)

Semester-IV				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
I	LANGUAGE	TAMIL/MALAYALAM/HINDI	F1TL41/ F1MY41/ F1HD41	3
II	ENGLISH	ENGLISH	F2EN41	3
III	CORE	PLANT DIVERSITY IV - GYMNOSPERMS, PALEOBOTANY AND EVOLUTION	FCBO41	4
III	CORE	PLANT DIVERSITY IV - GYMNOSPERMS, PALEOBOTANY AND EVOLUTION – PRACTICAL-IV	FCBOP4	2
III	ELECTIVE	ALLIED CHEMISTRY FOR BIOLOGICAL SCIENCES – II	FECH42	4
		PRACTICAL – SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS	FECHP4	2
IV	SEC 5	FERMENTATION TECHNOLOGY	FSBO41	2
IV		VALUE BASED EDUCATION	FVBE41	2
IV	NAAN MUDHALVAN	PRESERVATION OF FRUITS AND VEGETABLES		2

Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks

A. **Scheme for internal Assessment**:
Maximum marks for written test: **20 marks**
3 internal tests, each of **I hour** duration shall be conducted every semester.
To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks.

The break up for internal assessment shall be:
Written test- 20 marks; Assignment -5 marks Total - 25 marks

B. Scheme of External Examination
3 hrs. examination at the end of the semester
A – Part : 1 mark question two - from each unit
B – Part : 5 marks question one - from each unit
C – Part : 8 marks question one - from each unit

- **Conversion of Marks into Grade Points and Letter Grades**

S.No	Marks	Letter Grade	Grade point (GP)	Performance
1	90-100	O	10	Outstanding
2	80-89	A+	9	Excellent
3	70-79	A	8	Very Good
4	60-69	B+	7	Good
5	50-59	B	6	Above Average
6	40-49	C	5	Pass
7	0-39	RA	-	Reappear
8	0	AA	-	Absent

- **Cumulative Grade Point Average (CGPA)**

$$\mathbf{CGPA} = \frac{\mathbf{\Sigma\,(GP \times C)}}{\mathbf{\Sigma C}}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

- **Classification**
  a) First Class with Distinction : CGPA $\geq$ 7.5*****
  b) First Class : CGPA $\geq$ 6.0
  c) Second Class : CGPA $\geq$ 5.0 and $<$ 6.0
  d) Third Class : CGPA $<$ 5.0

Part 1 TAMIL

பொதுத்தமிழ் 4 - தமிழும் அறிவியலும்

அலகு 1: தமிழரின் அறிவியல் சிந்தனைகள்

1. அறிவியலும் மனித வாழ்வும்
2. ஐந்திணைப் பகுப்பும் சூழலியலும்
3. தொழில்நுட்ப மேலாண்மை
4. நேர் நிலம் மேலாண்மை

அலகு 2: பழந்தமிழ் இலக்கியங்களில் அறிவியல் சிந்தனைகள்

1. நிலவியல்
2. உலோகவியல்
3. வானவியல்
4. உயிரியல்
5. உளவியல்

அலகு 3: இடைக்கால இலக்கியங்களில் அறிவியல் சிந்தனைகள்

1. காப்பியங்களில் அறிவியல்
2. சிற்றிலக்கியங்களில் அறிவியல்
3. உரைநூல்களில் அறிவியல்

அலகு 4: இணையத் தமிழ்

1. இணையத் தமிழ் பயன்பாடு - அறிமுகம்
2. இணையத் தமிழ் கல்விக்கழகம்
3. இணைய நூலகம்
4. செயற்கை நுண்ணறிவியல்
5. தமிழ்நாட்டு அறிவியல் ஆளுமைகள்

அலகு 5: கடிதம் எழுதுதலும் கட்டுரை எழுதுதலும்

1. உறவு முறைக் கடிதப் பயிற்சி
2. அலுவலகக் கடிதப் பயிற்சி
3. விண்ணப்பப் படிவம் எழுதும் பயிற்சி
4. தன் விவரப் படிவம் எழுதும் பயிற்சி
5. கருத்து விளக்கக் கட்டுரைகள் எழுதும் பயிற்சி
6. பத்திரிகைகளுக்குக் கட்டுரை எழுதும் பயிற்சி

Text Books;

1. அறிவியல் தமிழ் இன்றைய நிலை - இராதா செல்லப்பன், உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை
2. மாணவ முஸ்தபா. தமிழில் அறிவியல் படைப்பிலக்கியம், மணவை பூப்பிளிகேஷன், சென்னை.
3. கலைச்சொல்லாக்கம் - மங்கை, ரங்கராசபுரம், சென்னை

Reference Books:

1. தமிழர் மேலாண்மை மரபுகள் - இல). செ. கந்தசாமி
2. சங்க இலக்கியத்தில் வேளாண் சமுதாயம், பொ. மாதையன், நியூ செஞ்சுரி புக் ஹவுஸ்

Websites:

1. https://www.chennailibrary.com/
2. முகப்பு - சிறுகதைகள்
3. www.tamilvirtualuniversity.org
4. Buy tamil books online 10% to 50% discount, Tamil Novels, Tamil Audio Books online – Buy tamil books online – Established 2010
5. www.katuraitamilblogspot.com

Part I MALAYALAM

DESKTOP PUBLISHING AND PRINTING IN MALAYALAM

UNIT I

This unit introduces basics of the printing technology, History of Malayalam printing-publishing-Newspapers-Journals-Social commitment -Propagation of ideas- Social struggle against invasion product of industrialization-printing in new era- - Data entry, DTP, editing, layout and Book publishing, e-publishing -: Significance of ISBN and ISSN..

UNIT II e -Malayalam – Malayalam in cyber space Detailed Study :

1. Malayalam computing-charithravalokanam.Dr.Mahesh Mangalatt ,Cyber Malayalam Sunitha T.V.(Ed)
2. Vayana, Ezhuthu, prasadhanam digital yugathil Dr.B.Iqbal(Grandhalokam- June 2013)

UNIT III e-Vayana- Reading in digital era Detailed Study :

1. E.vayana innathe Vayana– E-malayalam.Sunitha T.V State Institute of Languages.Thiruvananthapuram
2. Malayalam wiki media samrambhangal.Shiju Alex Cyber Malayalam .Sunitha T.V (Ed).Current Books.
3. Web magazinukal-Ini Vayana E Vayana.V.K Adarsh D C Books

UNIT IV Modern Media

Tools in Cyber space-editing tools

Unicode- Fonts- Drawing Tools, Painting tools. M S Paint- File Types (jpg ,IMG, XMP, Gif, PNG)

Resolution-Layers-Palattes, Greyscale, image, image recognition, Colour space, image transformation- image preview.

Detailed Study:

Unicode – Ini vayana e vayana – V.K Adarsh - D C Books

UNIT V

Proof reading techniques and cataloguing, cover designing, blurb writing

Detailed study:

Proof thiruthal.Vanijyaparamaya kathidapadukal.G.R.Pilla,
State Institute of Languages.Thiruvananthapuram

Reading List (Print and Online)

1. https://www.amazon.com/Desktop-publishing-Bittukumar/dp/9350570130
2. Computer parichayavum prayogavum.Dr.Achythsankar S Nair State Institute of languages.Thiruvananthapuram
3. Malayalam computing parimithikalum sadhyathakalum (Combiled.) Dr.Smitha K Nair
4. Sankethika patham-kerala University Publications
5. Computer Gurukulam-DTP ,Kairali Publications Thiruvananthapuram
6. Pusthaka nirmaanam - The state Institute of languages, Thiruvananthapuram
7. Proof reading - The state Institute of languages
8. Printing A to Z - K.J. Sam kutti
9. Ini vayana e vayana- V.K. Adarsh, D.C. books.
10. 1Printing Technology and Compositing- The State institute of Language s . T Thiruvananthapuram
11. Navamadhyamangal Bhaasha sahityam samskaram- Jose K Manuel, N B S
12. Cyber aadhunikata @ Malayalam – Jose K Manuel ,Athma Books
13. Bookstalgia- P.K. Rajasekharan- Mathrubhumi books
14. Pusthakam Untakunnathu- V.K. Haridas, Poorna publications, Kozhikode
15. An Introduction to Book Publishing D,Raghavan
16. Copy Editing- Judith Butcher
17. E Malayalam –Sunitha T.V- The State Institute of Language s

PART I HINDI
Hindi Bhasha aur Computer

Course Objectives
The Main Objectives of this course are to:
- Knowing about computer in Hindi
- Understanding Technical Hindi
- E-Learning and its aspects
- Hindi application with the Technical tools

Unit I
Computer aur Hindi
- Computer ka Parchay aur Vikas
- Computer mein Hindi ke Vividh Prayog

Unit II
Proudyogiki aur Hindi
- Unicode
- Dewanagari Lipi
- Hindi ki Vibhinna Website – Ek Parichay

Unit III
Computer ke madhyam se Hindi shikshan
- Vibhinna Shikshan Takkini ki
- Sarkari aur gair sarkari sansthao mein prayukt Hindi Bhasha

Unit IV
Vividh Paksh
- Internet par Hindi Bhasha
- Hindi SMS
- Hindi Tankan
- Hindi ke Vibhinna Prayukthi

Unit V
Pratiyogi priksha par aadharit Computer sambandhit prashikshan Karya
- Hindi mein Powerpoint banana
- Hindi mein Google Document thaiyar karna
- Hindi mein Google form taiyar karna
- Vibhinna pratiyogi parikshao ke bare mein suchna pradan karna

Reference Books

1. Social Networking: Naye Samay ka Samvad – Ed. Sanjay Dwivedi
2. Jansanchar aur Maas Culture – Jagdeeshwar
3. Media: Bhumandalikaran aur Samaj – Ed. Sanjay Dwivedi
4. Naye Jamane ki Patrakarita – Sourabh Shukla
5. Patrakarita se Media tak – Manoj Kumar

Related Online Contents (MOOCs, SWAYAM, NPTEL, YouTube, Websites, etc.)

1. https://techshindi.com/%E0%A4%AB%E0%A4%BC%E0%A5%89%E0%A4%A8%E0%A5%8D%E0%A4%9F%E0%A4%95%E0%A5%8D%E0%A4%AF%E0%A4%BE-%E0%A4%B9%E0%A5%88%E0%A4%82-%E0%A4%94%E0%A4%B0-%E0%A4%AF%E0%A5%87-%E0%A4%95%E0%A4%BF%E0%A4%A4%E0%A4%A8/
2. https://www.techyukti.com/2020/12/computer-font-kya-hai.html
3. https://chti.rajbhasha.gov.in/pdf/Chap4HindiShabadSansadhan2ndEditionPart2.pdf

Part II ENGLISH

UNIT I GOAL SETTING (UNICEF)

Life Story

1.1 From Chinese Cinderella – Adeline Yen Mah
1.2 Why I Write - George Orwell

Short Essay

1.3 On Personal Mastery – Robin Sharma
1.4 On the Love of Life – William Hazlitt

UNIT II INTEGRITY

Short Story

2.1 The Taxi Driver – K.S. Duggal
2.2 Kabuliwala - Rabindranath Tagore
2.3 A Retrieved Reformation – O Henry

Extract from a play

2.4 The Quality of Mercy (Trial Scene from the Merchant of Venice - Shakespeare)

UNIT III COPING WITH EMOTIONS

Poem

3.1 Pride – Dahlia Ravikovitch
3.2 Phenomenal Woman – Maya Angelou

Reader's Theatre

3.3 The Giant's Wife A Tall Tale of Ireland –William Carleton
3.4 The Princess and the God : A Tale of Ancient India

UNIT IV Language Competency Sentences

4.1 Simple Sentences
4.2 Compound Sentences
4.3 Complex Sentences

Direct and Indirect Speech

UNIT V Report Writing

5.1 Narrative Report
5.2 Newspaper Report

Drafting Speeches

5.3 Welcome Address
5.4 Vote of Thanks

Text Books (Latest Editions)

1. Oxford Practice Grammar , John Eastwood, Oxford University Press
2. Cambridge Grammar of English , Ronald Carter and Michael McCarthy
3. George Orwell Essays, Penguin Classics

Web Resources

1. http:/www.gradesaver.com/George-orwell-essays/study/summary
2. O' Henry. A Retrieved Reformation. https://americanenglish.state.gov/files/ae/resource_files/a-retrieved-reformation.pdf
3. Maya Angelou. Phenomenal Woman. https://www.poetryfoundation.org/poems/48985/phenomenal-woman
4. The Quality of Mercy, https://poemana1ysis.com
5. https://www'.oxfordscho1ar1yeditions.coin/disp1ay/10.1093/actrade/9780199235742.book.1/actrade-9780199235742-div1-106-William Hazilitt

PLANT DIVERSITY IV GYMNOSPERMS, PALEOBOTANY AND EVOLUTION

Learning Objectives

- To enable the students to understand the general characters, classification and economic importance of gymnosperms
- To enable the students to understand the morphology, internal structure and reproductionin Gymnosperms.
- To acquaint students with evidences of the past history of plant groups and significance of the fossilization.
- To understand the various fossil genera representing different fossil groups.
- To know about basic concepts on evolution and origin of life

UNIT I

GYMNOSPERMS

General characteristics, classification of Gymnosperms (Sporne,1954) (up to order)., Economic importance of Gymnosperms with special reference to oil, resin, timber, Ornamental and medicinal values..

UNIT II

Morphology, anatomy and reproduction of the taxa belonging to each of the following orders: Coniferales (Pinus). Gnetales (Gnetum).

UNIT III

PALEOBOTANY

Introduction to fossils and fossilization processes such as compression, casts, molds, petrification, impressions and coal balls. Geological time scale. Contributions of Birbal Sahni.

UNIT IV

Study of the following fossils: Rhynia, Lepidodendron and Lyginopteris

UNIT V

EVOLUTION

Evolution - origin of life, chemosynthetic theory - evidences (any five). Theories of evolution - Darwin, Lamark and De veries, modern synthetic theory.

Recommended Texts

1. Gupta, M.N. 1972. The Gymnosperms (2nd Edition) Shiva Lal Agarwala & Co., Agra.
2. Vashista, P.C. 1976. Gymnosperms, S.Chand & Co. New Delhi.
3. Bhatnagar, S.P and Moitra, A. 1996. Gymnosperms. New Age International

Publishers, New Delhi, India. 4. Anil Kumar. 2006. Gymnosperms. S. Chand & Company Pvt. Ltd. New Delhi. 5. Bhatnagar S.P and Alok Moitra. 2013. Gymnosperms. Publisher: New Age International Pvt Ltd Publishers. New Delhi.

Reference

1. Sporne, K.R.1991. The Morphology of Gymnosperme. B.I. Publications, Books New Delhi.
2. Bhatnagar, S.P and Moitra, A. 1996. Gymnosperms, New Age Int. Pvt. Ltd., New Delhi.
3. Stewart, W.N and Rathwell, G.W. 1993. Paleobotany and the Evolution of Plants. Cambridge University Press.
4. Raup, D.M and Steven, M. Stanley. 2004. Principles of paleontology. San Francisco: W.H. Freeman, 1971.
5. Bhatnagar S.P and Alok Moitra. 2013. Gymnosperms. Publisher: New Age International Pvt Ltd Publishers. New Delhi.

Web Resources

1. https://books.google.co.in/books?hl=en&lr=&id=Pn7CAAAQBAJ&oi=fnd&pg=PA1&dq=Introduction+to+Gymnosperms&ots=sfYSzCL02&sig=ysX1KRvetV0bAza4Sq6RWau4XU8&redir_esc=y#v=onepage&q=Introduction%20to%20Gymnosperms&f=false
2. https://books.google.co.in/books/about/Botany_for_Degree_Gymnosperm_Multicolor.html?id=HTdFYFNxnWQC&redir_esc=y
3. https://books.google.co.in/books/about/Gymnosperms.html?id=4dvyNckni8wC
4. https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf
5. https://www.palaeontologyonline.com/

PLANT DIVERSITY IV GYMNOSPERMS, PALEOBOTANY AND EVOLUTION - PRACTICAL-IV

Learning Objectives

- To enable students observe and record the morphological features of selected species of Gymnosperms.
- To enable students observe and record the anatomical features of selected species of Gymnosperms.
- To develop the skill of identification of fossil forms
- To enable students to gain knowledge on the contributions of evolutionary scientists
- To enable the students to identify gymnosperms in the natural habitats.

PRACTICALS

1. Study of morphology, anatomy and structure of the vegetative and reproductive organs of Pinus and Gnetum..
2. Study the following fossil forms: Rhynia, Lepidodendron and, Lyginopteris through permanent slides/photographs
3. Photograph of evolution scientists mentioned in the syllabus.
4. Field visit to study the habitat.

Recommended Texts

1. SharmaO.P and S, Dixit.2002.Gymnosperms.PragatiPrakashan.
2. Gangulee, H.C and A.K. Kar. 2013. College Botany. Vth Edition. S. Chand.
3. Sharma, O.P. 2012. Textbook of Pteridophyta, TATA MacMillan India Ltd., New Delhi.
4. Chamberlain, C.J. 1934. Gymnosperms: Structure and Evolution. Chicago Reprinted 1950). New York.
5. Bhatnagar, S.P and Moitra, A. 1996. Gymnosperms. New Age International Publishers, New Delhi, India.

Reference Books

1. Smith, G.M. 1955. CryptogamicBotanyVol.II.TataMcGrawHill. NewDelhi.
2. James.W. Byng. 2015. The Gymnosperms practical hand book. A practical guide to extant families and genera of the world. Published by plant Gateway, Tol Bot Street, Herford, SG137BX, United Kingdom.
3. Sharma, O.P. 2012. Textbook of Pteridophyta, TATA MacMillan India Ltd., New Delhi.
4. Chamberlain, C.J. 1934. Gymnosperms: Structure and Evolution. Chicago Reprinted 1950). New York.
5. Kirkaldy, J.E. 1963. The study of Fossils. Hutchinson Educational, London.

Web resources

1. https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms&printsec=frontcover
2. https://www.amazon.in/Paleobotany-Biology-Evolution-Fossil-Plants/dp/0123739721
3. https://books.google.co.in/books/about/Paleobotany.html?id=HzYUAQAAIAAJ
4. https://trove.nla.gov.au/work/11471742?q&versionId=46695996
5. http://www.freebookcentre.net/Biology/Evolutionary-Biology-Books.html.

CHEMISTRY FOR BIOLOGICAL SCIENCES II

(FOR BOTANY AND ZOOLOGY)

Objectives of the course

This course aims to provide knowledge on

- nomenclature of coordination compounds and carbohydrates.
- Amino Acids and Essential elements of biosystem
- understand the concepts of kinetics and catalysis
- provide fundamentals of electrochemistry and photochemistry

UNIT –I

Co-ordination Chemistry: Definition of terms IUPAC Nomenclature Werner'stheory EAN rule Pauling's theory-Postulates- Applications to [Ni(CO)4], [Ni(CN)4]2-, [Co(CN)6]3-, Chelation Biological role of Hemoglobin and Chlorophyll (elementary idea) - Applications in qualitative and quantitative analysis.

Water Technology: Hardness of water, determination of hardness of water using

EDTA method, zeolite method-Purification techniques -BOD and COD.

Unit- II

Carbohydrates

Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose.

Unit- III

Amino acids and Essential elements of biosystem

Amino acids: Classification preparation and properties of alanine, preparation of dipeptides using Bergmann method. Proteins- classification – structure – colour reactions- Biological functions –nucleosides – nucleotides - RNA and DNA . - structure. Essentials of trace metals in biological system –Na, Cu, K, Zn, Fe and Mg

UNIT- IV

Electrochemistry

Galvanic cells - Standard hydrogen electrode calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method - buffer solutions and its biological applications electroplating - Nickel and chrome plating-Types of cells-fuel cells-corrosion and its prevention.

UNIT –V

Photochemistry

GrothusDrapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence photosensitization and photosynthesis - definition with examples.

Recommended Text

1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mount publishing house, Chennai, first edition, 2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur, 2006.
3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry: S.Chand and Company, New Delhi, twenty third edition, 2012.
4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.

Reference Books

1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry: Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2. B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry, Vishal

Publishing Co., New Delhi, forty seventh edition, 2018.
3. B.K.Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

QUALITATIVE INORGANIC ANALYSIS (LAB)

Semi-Micro Qualitative Analysis

1. Analysis of simple acid radicals: Carbonate, sulphide,sulphate, chloride, bromide, iodide, nitrate
2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate.
3. Elimination of interfering acid radicals and Identifying the group of basic radicals
4. Analysis of basic radicals (group wise): Lead, copper, cadmium, nickel, cobalt, barium, ammonium.
5. Analysis of a simple salt containing one cation and one anion

Recommended Text

Reference Books:

1. V.Venkateswaran, R.Veera swamy and A.R.Kulandivelu, Basic Principles of Practical Chemistry, Sultan Chand & Sons, New Delhi, second edition, 1997.

Website and e-learning source

1. https://www.vlab.co.in/broad-area-chemical-sciences

VALUE BASED EDUCATION

Unit-I Introduction to Value based Education

a. Value: meaning and Classification

b. Value based Education: Meaning, Characteristics, Components and Contents

c. Value Erosion and Inculcation: Value crises in social life, economic life, and political life - Value inculcation: need and importance - Role of Parents and Teachers in inculcating values

Unit-II Harmony in Being and Living

a. Harmony of the self (I) with the body: Nurturing of the body- Understanding myself as co-existence of the self and the body- Understanding needs of self and needs of the body- Understanding the activities in the self and activities in the body.
b. Harmony in the Family, Society and Nature: Family as a basic unit of human interaction and values in relationships - Affection, care, guidance, reverence, Glory, gratitude, and love – Harmony in society: Justice preservation, Production Work, Exchange Storage Harmony in nature: four orders in nature- The holistic perception of harmony in existence.

Unit III: Social Issues, Social Justice and Human Rights

Social issues – causes and magnitude - alcoholism, drug addiction, poverty, unemployment

Social Justice: Definition and need – factors responsible for social injustice: caste and gender – contributions of social reformers.

Human Rights: Concept and Principles of human rights – human rights and Indian constitution – Rights of Women and children – violence against women

Unit IV: Values and Mass Media

Mass media: Meaning, functions and characteristics – Effects and Influence on youth and children – **Media Power** – socio, cultural and political consequences of mass mediated culture - consumerist culture – Globalization – new media- prospects and challenges – Role of media in value building

Unit V: Ethics

Ethics: Meaning and importance

Social ethics: tolerance, equity, justice for all, sensitivity towards mankind, love for nature and creatures, nationalism-love for nation, pride for nation, Honour to the law, Indian culture and traditions – Civic Sense: Being a good civilian

Professional Ethics: Dedication to work and duty – Commitment to the Profession

References:

1. Allport, G.W., Vermon, P.E., and Lindzey, G. (1970) study of values, Buston: Houghton Mifflin.
2. Central Board of Secondary Education (1997), Value Education: A Handbook for Teachers, Delhi: Central Board of Secondary Education.
3. Delors, J. (1996), Learning: The Treasure within- Report of the International Commission on Education for the Twenty-First Century, Paris: UNESCO.
4. Morris, Charles W. (1956). Varieties of Human Values. Chikago: University of Chicago Press.
5. Shukla, R.P. (2005). Value Education and Human Rights. Sarup& Sons, New Delhi
6. Satchidananda. M.K. (1991), "Ethics, Education, Indian Unity and Culture" – Delhi, Ajantha Publications
7. Saraswathi. T.S. (Ed) 1999. Culture", Socialisation and Human Development: Theory, Research and Application In India" – New Delhi Sage Publications.
8. Venkataiah. N (Ed) 1998, "Value Education" New Delhi Ph. Publishing Corporation.
9. Chakraborti, Mohit (1997) "Value Education: Changing Perspectives" New Delhi: Kanishka Publications.

Web Resources

1. https://testbook.com/ugc-net-paper-1/value-education

FERMENTATION TECHNOLOGY

Learning Objectives

- To appreciate the significance of microbes synthesizing fermented products.
- To gain insights in the principles of fermentation
- To design and operation of industrial practices in mass production of fermented products.
- To know about the various methods in fermentation technology.
- To learn about the bioproduct recovery.

UNIT I

Preparation of microbial culture, Preparation and sterilization of fermentation media. Isolation and improvement of industrially important microorganisms- Yeast, Lactobacillus.

UNIT II

Principles of fermentation: Submerged,solid state, batch, fed-batch and continuous culture

UNIT III

Production of fermented products, Maintenance and preservation of microorganisms involved in - cheese and bread.

UNIT IV

Fermentative production of Vinegar, Beer, Gluconic acid and Streptomycin

UNIT V

Microbial production of enzymes: Amylase and Protease. Bioproduct recovery.

Recommended Texts

1. Waites M.J. 2008. Industrial Microbiology: An Introduction, 7th Edition, Blackwell Science, London, UK.
2. Prescott S.C., Dunn C.G., Reed G. 1982. Prescott & Dunn's Industrial Microbiology, 4th Edition, AVI Pub. Co., USA.
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4. JR Casida L.E. 2015. Industrial Microbiology, 3rd Edition, New Age International (P) Limited Publishers, New Delhi, India.
5. Waites M.J., Morgan N.L., Rockey J.S. and Higton G. 2001. Industrial Microbiology: An Introduction. 1st Edition, Blackwell Science, London, UK.
6. Pelczar M.J., Chan E.C.S. and Krieg N.R. 2003. Microbiology. 5th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.

Reference Books

1. Peter F Stanbury, Allan Whitaker, Stephen J Hall. 2016. Principles of Fermentation Technology. Butterworth-Heinemann Press. UK.
2. Peppler, H. J. D. Perlman. 2014. Microbial Technology: Fermentation Technology. Academic Press.
3. T. El-Mansi, C. Bryce, Arnold L. Demain, A.R. Allman. Fermentation Microbiology and Biotechnology. Second Edition. 2006. CRC Press, USA.
4. Hongzhang Chen. Modern Solid State Fermentation: Theory and Practice. 2013. Springer Press, Germany.
5. John E. Smith. Biotechnology. 2009. Cambridge University Press.UK.
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7. Lancini, G. R. Lorenzetti. 2014. Biotechnology of Antibiotics and other Bioactive Microbial Metabolites. Springer publications, Germany.

Web resources

1. https://ebooks.foodtechlearning.xyz/2020/12/principal-of-fermentation-technology-by.html
2. https://www.amazon.in/Principles-Fermentation-Technology-Peter-Stanbury-ebook/dp/B01LMDYFNQ
3. https://www.amazon.in/Principles-Fermentation-Technology-Peter-Stanbury-ebook/dp/B01E3IC73W
4. https://www.pdfdrive.com/principles-of-fermentation-technology-e189052809.html
5. https://www.ebooks.com/en-us/book/2698294/principles-of-fermentation-technology/peter-f-stanbury/