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Resolution No. 38 {38-1 [38-1-16]}

INDEX

Skill Enhancement Courses (SEC)

Apiculture

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Apiculture	2	0	NIL	2	Class XII	NIL

Learning Objectives

The Learning Objectives of this course are as follows:

- To help the student to become familiar with the significance of beekeeping as an economically viable industry.
- It will help them to understand the different species of honeybees, their biology, behaviour and role in pollination.
- To train the students to learn the techniques of honey bee rearing, optimization of techniques based on climate and geographical regions, and various measures to be taken to maximize the benefits.
- To understand the significance of beekeeping in the diversification of agriculture for the rural communities to increase their income and create employment opportunities and at the same time to develop entrepreneurial skills required for self-employment in the beekeeping sector.

Learning Outcomes

Bythe end of the course, the students will be able to:

- Comprehend the various species of honey bees in India, their social organization and its importance.
- Appreciate the opportunities and employment in apiculture – in public, private andgovernment sector.
- Gain thorough knowledge about the techniques involved in bee keeping and honeyproduction.
- Make various products and by-products obtained from beekeeping sectorand theirimportance.
- Develop entrepreneurial skills necessary for self-employment in beekeeping sector.
- Enhance collaborative learning and communication skills through practical sessions, teamwork, group discussions, assignments and projects.

Skill development and job opportunities

- After completion of this course students would obtain the training in collection, identification, and various ways/aspects of bee rearing.
- The students can also take a job as an apiary worker, often called a beekeeper, manage colonies of honeybees for the production of honey as well as pollination services.

- The course would also provide a basic training to enable the students to construct hives and replace combs.
- Enhance entrepreneurial skills by collecting and packaging hive products including honey, beeswax and pollen.
- Make decisions on yards, treatment, splits, honey harvesting and all other beekeeping decisions.
- Identify and report hive health concerns.

SYLLABUS

Unit 1: Biology of Bees **4 weeks**

Historical background of apiculture, classification and biology of honey bees, Social organization of bee colony, behavioral patterns (bee dance, swarming).

Practical:

1. Study of the life history of honey bees: *Apiscerana indica*, *Apis mellifera*, *Apis dorsata*, *Apis florea*, *Melipona* sp. from specimen/ photographs - Egg, larva, pupa, adult (queen, drone, worker).
2. Study of morphological structures of honey bees through permanent slides/photographs– mouthparts, antenna, wings, sting apparatus and temporary mount of legs (antenna cleaner, mid leg, pollen basket).
3. Study of natural beehive and identification of queen cells, drone cells and brood.

Unit2: Rearing of Bees **4.2 weeks**

Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth; Bee Pasturage; Selection of bee species for apiculture –*Apiscerana indica*, *Apis mellifera*; Bee keeping equipment methods of extraction of honey (Indigenous and Modern) & processing; Apiary management - Honey flow period and lean period, effects of pollutants on honeybees**.**

Practical:

1. Distinguishing characters of workers of three bee species.
2. Importance of site selection for bee keeping.
3. Study of an artificial hive (Langstroth/Newton), its various parts and beekeeping equipment: draw diagrams of bee boxes proportionate to the body size and measure the body length and wing size.
4. Preparation of mount of pollen grains from flowers.

Unit3: Diseases and Enemies **2 weeks**

Bee diseases control and preventive measures: enemies of bees and their control.

Practical:

1. Diagnosis of honeybee diseases: Protozoan diseases, Bacterial diseases, Viral diseases (one each)-symptoms, nature of damage and control.
2. Identification of honeybee enemies: Predators-Insects and non-insects.

Unit4: Bee Economy **2 weeks**

Products of apiculture industry (Honey, Bees Wax, Propolis, Royal jelly, Pollen etc.) and their uses; Modern methods in employing artificial Beehives for cross pollination in horticultural gardens- stationary and migratory bee keeping.

Practical:

1. Video demonstration of wax extraction and preparation of comb foundation sheets.
2. Analysis of honey – purity, physical and biochemical parameters (any two constituents).
3. Study of bee pasturage – visit to fields/gardens/orchards for studying the bee activity (role in pollination, nectar collection, videography of honeybee activity) and preparation of herbarium of nectar and pollen yielding flowering plants (floral mapping).

Unit5: Entrepreneurship in Apiculture **2 weeks**

Bee keeping industries – Recent advancements, employment opportunities, economics in small and large-scale beekeeping, scope for women entrepreneurs in beekeeping sector, study of development programs and organizations involved in beekeeping in India.

Practical:

1. Visit to an apiary/honey processing unit/institute and submission of a report.

Essential/Recommendedreadings

Singh, S. (1962). Beekeeping in India, Indian Council of Agricultural Research, New Delhi.
Mishra, R.C. (1995). Honeybees and their management in India. Indian Council of Agricultural Research, New Delhi.
Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi.
Rahman, A. (2017). Beekeeping in India. Indian Council of Agricultural Research, New Delhi.
Gupta, J.K. (2016). Apiculture, Indian Council of Agricultural Research, New Delhi.

Examination scheme and mode:

Total Marks: 100

Internal Assessment (Practical): 25 marks

End Semester Practical Exam*: 75 marks

The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

For End Semester Practical Exam External to be appointed by the parent Department.

Applied Aquaculture

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Applied Aquaculture	2	0	NIL	2	Class XII	NIL

Learning Objectives

The Learning Objectives of this course are as follows:

- To give first-hand training on various aspects of Aquaculture.
- To understand the importance of different types of ponds required for aquaculture.
- To understand the properties of fertilizers and limes used in the aquacultural ponds.
- To gain experience in the management of optimum water quality in the fish production systems.
- To gather knowledge on the nutritional requirements of the cultivable species.
- To gain knowledge on the impact of live food and formulated feeds on fish growth.
- To enhance the quality of aquacrops and increase the production.

Learning Outcomes

By the end of the course, the students will be able to:

- Identify the useful aquaculture systems for sustainable aquaculture development.
- Recognize the suitable and economically important aquacultural species.
- Start the Fish hatchery business.
- Start fish-food production facility.
- Initiate entrepreneurship on Aquarium making and Ornamental fish production.
- Start entrepreneurship on Pearl culture and Prawn farming.
- Understand the importance of aquaculture in nutrition security, poverty elevation and employment generation.

Skill development and job opportunities

After completion of this course students may be

- Employed in various aquaculture related business including prawn and fish farms.
- Fully equipped to start their own entrepreneurship in **fish/ pearl/prawn farms**.
- Completely aware about the requirements to start their own **Ornamental fish industry**.
- Start a **Fish Processing industry**.

SYLLABUS

Unit I: Introduction to Aquaculture **2.5 weeks**

Introduction to various types of fish ponds and economically important cultivable finfish and shellfish. The impact of aquatic plants and insects in the production of aquacrops.

Practical:

1. Designing (layout) and drawing of a self-sustainable Aquaculture farm.
2. Identification of cultivable finfishes and shellfishes and drawing of their pictures.Drawing and labeling of various external and internal organs of a model food fish (carp/ catfish).
3. Collection and identification of various freshwater aquatic plants. Understanding of the role of different aquatic plants in aquaculture.
4. Identification of harmful aquatic insects and their remedial measures.
5. Identification of various phytoplankton and zooplankton.

Unit II: Aquaculture Technology **2.5 weeks**

Application of advance technology for the sustainable development of Aquaculture in India.

Practical:

1. Designing of a Recirculating Aquaculture System (RAS) and understanding of functions of its various parts in the maintenance of water quality.
2. Designing of an Aquaponics System and its role in the sustainable aquaculture development.
3. Fish Breeding: natural breeding and induced breeding. Identification of various developmental stages of fish, starting from fertilized eggs.
4. Construction of a fish aquarium.
5. Maintenance of one Aquarium with fish during the Course tenure.
6. Value addition in aquacrops and their preservation.

Unit III: Culture of Economically Important Organisms **2.5 weeks**

The role of water quality in the production of healthy aquacrops. Culture of economically important aquacultural species.

Practical:

1. Study of major water quality parameters *viz*., temperature, pH, dissolved oxygen, free carbon dioxide, alkalinity and ammonia in a fish culture pond.
2. Culture of live food organisms.
3. Culture of any fish larvae and their feeding.
4. Ornamental fish culture.
5. Pearl culture.
6. Culture of prawns.

Unit IV: Feed Formulation **2.5 weeks**

The formulation of on farm feed for fishes using locally available ingredients and evaluation of the nutritional value of the prepared feed.

Practical:

1. Selection of non-conventional ingredients for the formulation of fish feed.
2. The study of biochemical composition (protein, lipid, carbohydrates and ash) contents of the ingredients.
3. Formulation of fish feed using locally available ingredients.
4. The assay of biochemical composition of formulated feed: protein, lipid, carbohydrate and ash.
5. Feeding techniques: hand feeding, bag feeding, demand feeding etc.
6. Evaluation of impact of prepared feed on the water quality of the culture system.

Unit V: Role of Fish in Environmental Management **1 week**

The application of aquatic organisms in the environmental management.

Practical:

1. Use of fish as a bio-indicator.
2. Use of fish to control the eutrophication of the water body.
3. Use of fish to control mosquito.

Unit VI: Visits **2weeks**

Exposure of students to the various Aquacultural facilities.

Practical:

1. Visits to the local Fish market/fish farm to get exposure to the various fishes.
2. Exposure to advanced aquacultural systems, *viz*. Recirculating Aquaculture System, Aquaponics System.
4. **Exposure to Pearl culture technology,** visit to a National Institute.
5. Visit to a fish processing industry.

Unit VII: Aquaculture in Practice **2 weeks**

Handling of aquatic organisms.

Practical:

1. First hand workingexperience with fish (minimum 15 days) in a fish farm/institute/laboratory.
2. Preparation of a project proposal in any area of aquaculture for financial support.

Recommended Books:

AOAC, Association of Official Analytical Chemists. 2000. Official Methods of Analysis. Washington, DC: Association of Official Analytical Chemists Inc.

APHA, American Public Health Association. 2012. Standard Methods for the Examination of Water and Waste Water. 22nd ed. Washington DC: American Public Health Association, American Water Works Association, Water Environment Federation.

Pillay, T. V. R. 2005. Aquaculture. Principles and Practices. Blackwell Publishing, New Delhi, India.

Chakrabarti, R. and Sharma, J. G. 2008. Aquahouse. New Dimension of Sustainable Aquaculture. DIPAS, Indian Council of Agricultural Research, New Delhi, India.

Holt, G. J. 2021. Larval Fish Nutrition. Willey-Blackwell, UK.

Examination scheme and mode:

Total Marks: 100
Internal Assessment(Practical): 25 marks
End Semester Practical Exam* : 75 marks

The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.
For End Semester Practical Exam External to be appointed by the parent Department.

BIOINOCULANTS FOR AGRICULTURE AND SUSTAINABLE DEVELOPMENT

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
BIOINOCULANTS FOR AGRICULTURE AND SUSTAINABLE DEVELOPMENT	**2**	**0**	**0**	**2**	**None**	**NIL**

Learning Objectives

The Learning Objectives of this course are as follows:

- The objective of this course is to make students aware of the role of microorganisms in sustainable development and remediation.
- This course will train students to develop their own biofertilizers and other kinds of bio-inoculants for use in agriculture and environment.
- The course is designed for skill development in initiating a bioinoculant-based low cost startup.

Learning outcomes

The Learning Outcomes of this course are as follows:

- The student will be aware of the role of microbes in sustainable development and how microbes can be used in remediation of damaged environments.
- The student will be skilled in isolating microorganisms from a variety of different sites. Will learn Selection, purification and preservation of useful cultures.
- The student will be skilled in formulating bioinoculants and test its efficacy.

SYLLABUS

Practical

UNIT – I (5 Weeks)

Introduction and scope of bioinoculants: Biofertilizers: success story – biofertilizer production under ICAR - How Biofertilizers for Corn Went Commercial. Biopesticides: success story of using biopesticides for nematode management in horticultural crops. Bioinoculants as a solution to the problem of parali (stubble) burning: case study of “PUSA Decomposer”. Bioinoculants for reforestation. Bioinoculants for the reclamation of waste lands having alkaline, acidic, heavy metal-contaminated soils. Bioinoculants for clearance of oil spills. Mycorrhizal inoculants. Some important commercially available bioinoculants.

UNIT – II (7 Weeks)

Isolation of microorganisms for the preparation of bioinoculants: Isolation of phosphate solubilizers, free-living nitrogen fixers, heavy metal-accumulating microbes, alkalophiles, acidophiles from suitable soil samples. Observation of colony morphology and microscopic structure of selected microbes and preservation of these cultures in slants and glycerol stocks.

UNIT – III (3 Weeks)

Formulation of bioinoculant using selected microbes (student group project): Culturing of selected microbes from those isolated, and formulating them into a bioinoculant. Preparation of workflow for evaluating efficacy in potted plants and in fields, for determining shelf life, and stability.

Essential/recommended readings

1. Microbiology: A Lab Manual by J. G. Cappuccino and C. T. Welson. 12th edition.
2. Pearson. 2020.
3. Bio-inoculants as prospective inputs for achieving sustainability: Indian Story by C. Gupta et al. Economic Affairs. Vol. 65, No. 1, pp. 31-41. 2020.
4. Bioinoculants for bioremediation applications and disease resistance: Innovative Perspectives by T. Chaudhary and P. Shukla. Indian J Microbiol. 59 (2): 129–136. 2019.
5. Remediation of metalliferous soils through the heavy metal resistant plant growth promoting bacteria: paradigms and prospects by M. Ahemad. Arabian Journal of Chemistry, 12 (7);1365-1377. 2019.
6. Laboratory manual of Microbiology and Biotechnology by K.R. Aneja. 2nd edition. Scientific International Pvt. Ltd., Delhi. 2018.
7. Online resource: https://www.jaivikkheti.in/DMS/Waste-Decomposer%20Book-Eng.pdf
8. Online resource: https://www.iihr.res.in/success-story-using-biopesticides-nematode-management-horticultural-crops.
9. Biofertilizer Production under ICAR All India Network Project on Soil Biodiversity Biofertilizers DOI: 10.13140/RG.2.2.26840.42244
10. Online resource: https://blog.teamtrade.cz/the-story-of-how-biofertilizers-for-corn-went-commercial-part-one/
11. Online resource: https://en.wikipedia.org/wiki/Microbial_inoculant

Suggestive readings (if any)

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

Early Child Care and Education Settings

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical /Practice		
Early Child Care and Education Settings	**2**	**-**	-	**2**	Class 12	

Learning Objectives

The Learning Objectives of this course are as follows:

- To understand the significance of early childhood years and the importance of ECCE
- To understand developmental milestones and delays in development
- To plan, organize and create care facilities and developmentally appropriate material for infants and young children.
- To be acquainted with the ECCE centre, its daily routine, requirements, functioning and evaluation of the programme.
- To trace the progression of children in early childhood setting

Learning outcomes

The Learning Outcomes of this course are as follows:

- The student will be able to explain the significance of early childhood development and ECCE
- The student will become familiar with developmental milestones and learn to assess children in early years.
- The student will be able to understand, plan and organize care activities for young children
- The student will be able to prepare activities and aids for fostering development in the early years
- The student will be able to learn about evaluation of an ECCE programme

SYLLABUS

Unit 1: Importance of early years and significance of ECCE (5 weeks)

The unit will help to develop an understanding on the concept and importance of ECCE

- Meaning and objectives of ECCE and importance of early years
- Norms and developmental milestones of infants and young children
- Observations, developmental checklists and developmental delays
- Nurturing care framework and early childcare practices
- Review of existing ECCE programmes and policies in India

Unit 2: Developmentally appropriate activities for young children (5 weeks)

The unit will focus on ways to promote development during early years through play and exploratory activities.

- Care and stimulation activities for infants and young children
- Plan and prepare multi-sensory materials and activities to promote development across domains: Physical motor, socio-emotional, cognitive and language development
- Use of music, dance, drama, storytelling, puppetry, rhymes/poems and art and craft
- Importance of- Indoor and outdoor activities; individual and group activities; free play and guided play; circle time
- Activities for school readiness

UNIT 3: Components of ECCE Programme (5 weeks)

The unit will focus on the understanding of infrastructure, materials and equipment, curriculum development and assessing the development of children.

- Daily routines in child care and preschool centres
- Creating safe spaces for children: Organizing indoor and outdoor material and equipment
- Understanding the ECCE curriculum: Developing daily, weekly and monthly plans
- Assessing children's development across domains
- Indicators of a quality ECCE centre

Essential Readings

- ECCE National Curriculum Framework- https://wcd.nic.in/sites/default/files/national_ecce_curr_framework_final_03022014%20%282%29.pdf
- Managing Children's Programmes: Some Perspectives. Indira Gandhi National Open

University DECE Study Material. http://www.ignouhelp.in/ignou-dece-study-material/

- Morrison, G. S. (2018). Early Childhood Education Today. Pearson
- National Education Policy 2020-education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
- Organizing a Child Care Centre. Indira Gandhi National Open University DECE Study Material
- Soni, R. (2015). Theme Based Early Childhood Care and Education Programme: A Resource Book. National Council of Educational Research and Training.
- Swaminathan, M. (1998). The First Five Years. Sage Publications

Recommended Readings

- Aggarwal, J. C. (2007). Early Childhood Care and Education: Principles and Practices. Shipra: New Delhi.
- Arni, K. and Wolf G. (1999). Child Art with Everyday Materials. TARA Publishing.
- Mohanty, J. Mohanty, B. (1996). Early childhood care and Education. Deep and Deep Publication, New Delhi.
- Morrison, G. S. (2003). Fundamentals of early childhood education. Merrill/Prentice Hall:
- Play Activities for Preschoolers – 1 and 2. Indira Gandhi National Open University DECE Study Material
- Virginia Singh, A. (1995). Playing to Learn: A training manual for Early Childhood Education. M. S. Swaminathan Research Foundation.

Note: Learners are advised to use the latest edition of readings

Examination scheme and mode:

Total Marks: 50
Internal Assessment: 25 marks
Practical Exam (Internal): 25marks
End Semester University Exam:
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

Healthy and Sustainable Food Choices

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title& Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisiteof the course (if any)
		Lecture	Tutorial	Practical /Practice		
Healthy and Sustainable Food Choices	**2**	**-**	**-**	**2**	Class 12	

Learning Objectives

The Learning Objectives of this course are as follows:

- To identify healthier food options
- To understand portion control for foods
- To demonstrate skill for preparing healthy and nutritious dishes
- To link sustainability with healthy food choices

Learning Outcomes

The Learning outcomes of this course are as follows:

- To be able to select and prepare healthier food options
- To relate the influence of food environment on food choices
- To comprehend the importance of sustainable food choices

SYLLABUS

Unit 1: Healthy food choices (3 weeks)

Identification of healthy and unhealthy foods and Understanding the immediate food environment

- Food labels and basics of nutrient profiling models to classify foods as HFSS
- Nutrient profiling of commonly consumed food items
- Exploring the food environment by mapping the food outlets and food available near home and college

Unit 2: Food portion sizes and related factors (3 weeks)

Understanding food portion sizes and its relation to nutrient density

- The concept of portion/serving sizes and portion control
- Estimation of energy and nutrient density of selected food products using nutrient composition database

Unit 3: Basics of food preparation (5 weeks)

Planning and preparation of healthy and nutritious dishes

- Planning and preparation of the following:
  - Snacks
  - Soups and Salads
  - Desserts
  - Meal combinations

Unit 4: Sustainability and healthy food (4 weeks)

Linking the concept of healthy eating with sustainability

- Identification of nutritious food sources which have minimal impact on the environment
- Case study on understanding food supply chain and carbon footprints of any commonly consumed foods

Essential readings

- Chadha R and Mathur P (2015). Nutrition - A Lifecycle Approach. New Delhi: Orient Blackswan Pvt Ltd.
- Longvah T, Ananthan R, Bhaskarachary K and Venkaiah K (2017). Indian Food Composition Tables. National Institute of Nutrition, Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Government of India, Hyderabad.
- Khanna K, Gupta S, Seth R, Mahna R, Rekhi T (2004). The Art and Science of Cooking: A Practical Manual, Revised Edition. New Delhi: Elite Publishing House Pvt Ltd.
- Raina U, Kashyap S, Narula V, Thomas S, Suvira, Vir S, Chopra S (2010). Basic Food Preparation: A Complete Manual, Fourth Edition. Hyderabad: Orient Black Swan.

Recommended readings

- HLPE. 2017. Nutrition and food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome. https://www.fao.org/3/i7846e/i7846e.pdf

- Agarwal P and Mathur P (2021). Eat Right - A Food Systems Approach . New Delhi: Food Future Foundation

- NIN-ICMR. Food Based Dietary Guidelines for Indians

Note: Learners are advised to use the latest edition of readings.

Examination scheme and mode:

Total Marks: 50
Internal Assessment: 25 marks
Practical Exam (Internal): 25marks
End Semester University Exam:

The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty

Image Styling

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisiteof the course (if any)
		Lecture	Tutorial	Practical /Practice		
Image Styling	2	--	--	2	Class 12	

Learning Objectives

The Learning Objectives of this course are as follows:

- To strengthen the student's hands on experience in using different tools of improving the visual and non-visual appearance
- To train the students with technical and professional ways of understanding wardrobe needs and their development
- To develop skills in understanding fashion trends for planning personal shopping .

Learning Outcomes

The Learning Outcomes of this course are as follows:

- Demonstrate the practical ways to strengthen physical image based on body type, face shape and personal style analysis.
- Understand the effect of elements and principles of design on visual appearance.
- Explain the fashion trends of apparel and accessories.
- Identify wardrobe elements and the processes of planning and organization.
- Plan personal shopping of apparel and accessories based on physical traits, personal style and budget.

SYLLABUS

Unit 1: Physical traits and analysis **(3 weeks)**

Learning the first step in styling by developing skills to analyze individual characteristics such as body type, proportions, face shapes etc.

Subtopics:

- Body types
- Body proportion
- Face shapes
- Personal colour analysis

Unit 2: Application of elements and principles of design for image styling (3 weeks)

Understanding the basics of design by learning about the various elements and principles of design, their role in the success of a design, and their importance in personal styling.
Subtopics:

- Effects of design elements and principles on clothing and visual appearance
- Effect of garment components on visual appearance

Unit 3: Wardrobe planning (2 weeks)

Learning the skills of wardrobe planning, analysis and management as per apparel and accessory needs.
Subtopics:

- Wardrobe analysis
- Wardrobe essentials
- Organization and categorization of wardrobe
- Elements of a basic wardrobe
- Optimising wardrobe and budgeting

Unit 4: The business of styling (4 weeks)

Understand the working of styling business. Developing the art of styling. Analyzing the present market trends.

Subtopics:

- Dress vs Style
- Analysis of trends of apparels and accessories
- Survey of apparel and accessory stores/ brands with respect to style, size and price.
- Types of stylists: Freelance stylists, Celebrity stylists, Editorial stylists
- Marketing your business
- Forms and Contracts

Essential Readings

1. Constantine, S. & Woodall, T. *The Body Shape Bible: Forget Your Size Discover Your Shape Transform Yourself*, published by Weidenfeld & Nicolson (1877), ASIN: B01K14NWB8
2. Funder, D.C. 2001, The Personality *Puzzle (2nd ed)*, New York: W.W. Norton
3. Phares, J.E. 1991, *Introduction to Personality (3rd ed)*, New York: Harper Collins
4. Rasband, J. *Wardrobe Strategies for Women*, published by Fairchild Books; Student edition (September 18, 2001), ISBN-10: 1563672596

Suggested Readings

1. Baumgartner, J. *You are What You Wear*, Da Capo Press (2012)
2. Mc Call, *Sewing in Color*, Hamlyn Publishing Group 11th edition (1975)

3. Romano, C. *Plan your Wardrobe*, New Holland Publishers (1998)

Vega, L. *The Image of Success*, American Management Association (2010)

Note: Learners are advised to use the latest edition of readings.

Examination scheme and mode:

Total Marks: 50
Internal Assessment: 25 marks
Practical Exam (Internal): 25marks
End Semester University Exam:
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Fieldwork, Presentations, amongst others as decided by the faculty.

Content Development and Media for Children

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisiteof the course (if any)
		Lecture	Tutorial	Practical /Practice		
Content development and Media for Children	**2**	**-**	-	**2**		

Learning Objectives

The Learning Objectives of this course are as follows:

- To explore and review current trends in media and content for children
- To plan developmentally appropriate media and content for children
- To create culturally appropriate content for learning

Learning Outcomes

The Learning Outcomes of this course are as follows:

- The student will be able to identify forms of content and media available for children
- The student will be able to understand the impact of content and media on thoughts, attitudes, and values of children
- The student will learn to create age-appropriate content and media for children

SYLLABUS

Unit 1: Content for children: Relationship and interaction (5 weeks)

This unit will cover the different forms of content available to children and will create a linkage between children, content and context

- Exploring different forms of content for children (exposure to history and folk forms)
- Children's usage and significance of print, audio visual content
- Review and analysis of available content for children
- Enabling parents/caregivers to be able to use content appropriately with children

Unit 2: Media for Children (5 weeks)

This unit will discuss the different forms of media available to children in the contemporary context and also focus on advances in media technology

- Different media forms available for children
- Children's use and significance of media forms
- Assessing the portrayal of children in media; assessing the quality of Print, App or TV program, website, film
- Media literacy for children, parents and caregivers

Unit 3: Developing content and media for children (5 weeks)

This unit will enable students in developing content and media for children.

- Scripting for children: content and structure; Literature for and by children; Writing stories/poems for children (significance of humour, wonder, logic)
- Music/ Dance/Theatre/puppetry as sources for content development and dissemination
- Creating age-appropriate content for:
  - Developmental and domain specific needs
  - Children activity box/ Preschool Kit
  - Interactive Mobile applications/Digital content

Essential readings

- Condry, J. (1989). *The Psychology of Television.* Lawrence Erlbaum, Associates, Inc.
- Daniel,A.K. (2012). *Storytelling across the Primary Curriculum.* London: Routledge.
- Engel, S. (1999). *The Stories Children Tell: Making Sense of the Narratives of Childhood.* USA: W.H.. Freeman and Company.
- Honig, A. (1983). *Television and young children.* Young children 38(4).
- Joshi, P. & Shukla, S. (2019). *Child development and education in the twenty-first century.* Singapore: Springer International.
- Livingstone, S. (2002). *Young People and New Media.* New Delhi: Sage
- Prakash, S. &Mathur, P. (2000). *Children and TV.* NCERT,
- Real, M. R. (1996). *Exploring Media Culture.* New Delhi: Sage
- Singer D.G. & Jerome L. (2012). *Handbook of Children and Media.* California: Sage.

Recommended Readings:

- Calvert, S.L. & Wilson, B.J. (2008). *The Handbook of Children, media and Development.* United Kingdom: Blackwell Publishing.
- Jordan, A.B. & Romer, D. (2014). *Media and the Well-Being of Children andAdolescents.* New York: Oxford University Press.

Note: Learners are advised to use the latest edition of readings.

Examination scheme and mode:

Examination scheme and mode:

Total Marks: 50
Internal Assessment: 25 marks
Practical Exam (Internal): 25marks
End Semester University Exam:
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

Small Scale Catering

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title& Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisiteof the course (if any)
		Lecture	Tutorial	Practical /Practice		
Small Scale Catering	**2**	**-**	**-**	**2**		

Learning Objectives

The Learning Objectives of this course are as follows:

- To comprehend fundamentals of menu planning through management of resources in a food service establishment.
- To develop insight for recipe standardization and to apply acquired skills in menu planning and quantity food production.
- To use knowledge of preliminary steps for starting a small-scale catering unit.

Learning Outcomes

The Learning outcomes of this course are as follows:

- The students will be able to comprehend fundamentals of menu planning through management of resources in a food service establishment.
- The students will be able to develop insight for recipe standardization.
- The students will be able to apply acquired skills in menu planning and quantity food production
- The students will be able to use knowledge of preliminary steps for starting a small-scale catering unit.

SYLLABUS

Unit 1: Introduction to Food Service (3 weeks)

Kinds of food service establishments, kinds of food service outlets

- Market survey of various food products raw and processed in different kinds of markets.
- Survey of a nearby small-scale catering unit

Unit 2: Food Production (8 weeks)

- Menu planning: Importance of menu, factors affecting menu planning, types of menus, menu planning for different kinds of food service units, features of good menu card
- Basics of food purchase, receiving and storage
- Quantity food production: standardization of recipes, quantity food preparation techniques, recipe adjustments and portion control
- Hygiene and Sanitation

- Planning menus within specified budget for the following:
  - Menu for a birthday party/ nursery school.
  - Packed tiffin lunch for MNC employees.
  - Cyclic menu for catering breakfast, lunch and dinner for PG/ hostel girls.
- Evaluation of menu card
- Visit to a small-scale catering unit
- Use of computers in inventory and billing
- Standardization of a recipe
- Scaling up of recipe for large number of customers (75)
- Food stall/ event catering
- Demonstration of specific dishes for entrepreneurial set up
- Use of checklist to assess implementation of good hygiene and sanitation practices in a small-scale catering unit

Unit 3: Planning of a Food Service Unit (4 weeks)

- Preliminary planning: survey of types of units, identifying clientele, menu, operations and delivery
- Planning the set up:
- Identifying resources (money, manpower, time, facilities, equipment, utilities, types of kitchen areas, flow of work and work area relationship), types of services and delivery system, business registration
- Basics of Finance (Components of cost and factors affecting them, determining the selling price)

- Market survey/visit for equipment
- Development of a business plan

Essential/Recommended Readings

- Desai V. (2011) The Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House Pvt. Ltd., Mumbai.
- Mohini, S. (2005) Institution Food Management New Age International Publishers.
- West, B.B.& Wood, L. (1988) Food Service in Institutions 6th Edition Revised By Hargar FV, Shuggart SG, &Palgne Palacio June, Macmillan Publishing Company New York.

Suggested Readings

- Knight, J.B. & Kotschevar, L.H. (2000) Quantity Food Production Planning & Management 3rd edition John Wiley & Sons.
- Payne-Palacio, J. & Theis, M. (2011) Foodservice Management: Principles and Practices

12th ed.

- Taneja, S. & Gupta, S. L. Entrepreneur Development- New Venture Creation. GalgotiaPublishing Company

Note: Learners are advised to use the latest edition of readings.

Examination scheme and mode:

Total Marks: 50
Internal Assessment: 25 marks
Practical Exam (Internal):
25marksEnd Semester
University Exam:
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty

RADIATION SAFETY

Course Title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical		
Radiation Safety	**2**	**1**	**0**	**1**	Class XII pass with Physics and Mathematics as main subjects	Physics and Mathematics syllabus of class XII

Learning Objectives:

- This course focuses on the applications of nuclear techniques and radiation protection.
- It will not only enhance the skills towards the basic understanding of the radiation but will also provide the knowledge about the protective measures against radiation exposure.
- It imparts all the skills required by a radiation safety officer or any job dealing with radiation such as X-ray operators, jobs dealing with nuclear medicine: chemotherapists, operators of PET, MRI, CT scan, gamma camera etc.

Learning Outcomes:

This course will help students in the following ways.

- Awareness and understanding the hazards of radiation and the safety measures to guard against these hazards.
- Having a comprehensive knowledge about the nature of interaction of matter with radiations like gamma, beta, alpha rays, neutrons etc. and radiation shielding by appropriate materials.
- Knowing about the units of radiations and their safety limits, the devices to detect and measure radiation.
- Learning radiation safety management, biological effects of ionizing radiation, operational limits and basics of radiation hazards evaluation and control, radiation protection standards,
- Learning about the devices which apply radiations in medical sciences, such as X-ray, MRI, PET, CT-scan

SYLLABUS

THEORY COMPONENT

Unit 1: **(6 Weeks)**

Radiation and its interaction with matter: Basic idea of different types of radiation electromagnetic (X-ray, gamma rays, cosmic rays etc.), nuclear radiation and their origin.
Nuclear Radiation: Basic idea of Alpha, Beta, Gamma neutron radiation and their sources (sealed and unsealed sources).
Interaction of Charged Particles (including alpha particles): Heavy charged particles (e.g. accelerated ions) - Beth-Bloch Formula, Scaling laws, Mass Stopping Power, Range, Straggling.
Interaction of Beta Particles: Collision and Radiation loss (Bremsstrahlung).
Interaction of Photons: Linear and Mass Attenuation Coefficients.
Interaction of Neutrons: Collision, slowing down and Moderation.

Unit 2: **(4 Weeks)**

Radiation detection and monitoring devices: Basic concepts and working principle of gas detectors, Scintillation Detectors, Solid State Detectors and Neutron Detectors, Thermo-luminescent Dosimetry.
Radiation Quantities and Units: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, annual limit of intake (ALI) and derived air concentration (DAC).

Unit 3: (2 Weeks)

Radiation Units, dosage and safety management: Basic idea of different units of activity, KERMA, exposure, absorbed dose, equivalent dose, effective dose, collective equivalent dose, annual limit of intake (ALI) and Derived air concentration (DAC).

Radiation safety management: Biological effects of ionizing radiation, Operational limits and basics of radiation hazards, its evaluation and control: radiation protection standards.

Unit 4: (3 Weeks)

Application of radiation as a technique: Application in medical science (e.g., basic principles of X-rays, MRI, PET, CT scan, Projection Imaging Gamma Camera, Radiation therapy), Archaeology, Art, Crime detection, Mining and oil. Industrial Uses: Tracing, Gauging, Material Modification, Sterilization, Food preservation.

PRACTICAL COMPONENT

Minimum five experiments need to be performed from the following, graphs to be plotted using any graphical plotting software

1) Estimate the energy loss of different projectiles/ions in Water and carbon, using SRIM/TRIM etc. simulation software, (different projectiles/ions to be used by different students).
2) Simulation study (using SRIM/TRIM or any other software) of radiation depth in materials (Carbon, Silver, Gold, Lead) using H as projectile/ion.
3) Comparison of interaction of projectiles with Z_P = 1 to 92 (where Z_P is atomic number of projectile/ion) in a given medium (Mylar, Carbon, Water) using simulation software (SRIM etc).
4) SRIM/TRIM based experiments to study ion-matter interaction of heavy projectiles on heavy atoms. The range of investigations will be Z_P = 6 to 92 on Z_A = 16 to 92 (where Z_P and Z_A are atomic numbers of projectile and atoms respectively). Draw and infer appropriate Bragg Curves.
5) Calculation of absorption/transmission of X-rays, γ-rays through Mylar, Be, C, Al, Fe and Z_A = 47 to 92 (where Z_A is atomic number of atoms to be investigated as targets) using XCOM, NIST (https://physics.nist.gov/PhysRefData/Xcom/html/xcom1.html).
6) Study the background radiation in different places and identify the source material from gamma ray energy spectrum. (Gamma ray energies are available in the website http://www.nndc.bnl.gov/nudat2/).
7) Study the background radiation levels using Radiation meter.
8) Study of characteristics of GM tube and determination of operating voltage and plateau length using background radiation as source (without commercial source).
9) Study of counting statistics using background radiation using GM counter.
10) Study of radiation in various materials (e.g. KSO_4 etc.). Investigation of possible radiation in different routine materials by operating GM counter at operating voltage.
11) Study of absorption of beta particles in Aluminum using GM counter.
12) Measurement of gamma ray attenuation co-efficient of aluminium using GM counter.
13) Estimation of half thickness for aluminium using GM Counter.

References:

Essential Readings:

1) Basic ideas and concepts in Nuclear Physics: An introductory approach by K Heyde, third edition, IOP Publication, 1999.
2) Nuclear Physics by S N Ghoshal, First edition, S. Chand Publication, 2010.
3) Nuclear Physics: Principles and Applications by J Lilley, Wiley Publication, 2006.
4) Fundamental Physics of Radiology by W J Meredith and B Massey, John Wright and Sons, UK, 1989.
5) An Introduction to Radiation Protection by A Martin and S A Harbisor , John Willey and Sons, Inc. NewYork, 1981.

Additional Readings:

1) Radiation detection and measurement by G F Knoll, 4th Edition, Wiley Publications, 2010.
2) Techniques for Nuclear and Particle Physics experiments by W R Leo, Springer, 1994.
3) Thermoluminescence dosimetry by A F Mcknlay, Bristol, Adam Hilger (Medical Physics Hand book 5
4) Medical Radiation Physics by W R Hendee, Year book Medical Publishers, Inc., London, 1981.
5) Physics and Engineering of Radiation Detection by S N Ahmed, Academic Press Elsevier, 2007.
6) IAEA Publications: (a) General safety requirements Part 1, No. GSR Part 1 (2010), Part 3 No. GSR Part 3 (Interium) (2010); (b) Safety Standards Series No. RS-G-1.5 (2002), Rs-G-1.9 (2005), Safety Series No. 120 (1996); (c) Safety Guide GS-G-2.1 (2007).

References (for Laboratory Work):

1) Schaum's Outline of Modern Physics, McGraw-Hill, 1999.
2) Schaum's Outline of College Physics, by E. Hecht, 11^{th} edition, McGraw Hill, 2009.
3) Modern Physics by K Sivaprasath and R Murugeshan, S Chand Publication, 2010.
4) AERB Safety Guide (Guide No. AERB/RF-RS/SG-1), Security of radioactive sources in radiation facilities, 2011

AERB Safety Standard No. AERB/SS/3 (Rev. 1), Testing and Classification of sealed Radioactivity Sources., 2007.

Chemistry Lab Standard Operations and Safety Measures

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisiteofthecourse (ifany)
		Lecture	Tutorial	Practical/ Practice		
Chemistry Lab Operations and Safety Measures	**2**	**0**		**2**	XIIth Pass with Science	NA

Learning Objectives

- To cultivate efficient working skills among the students to work in a chemistry laboratory
- To create a trained workforce which can responsibly learn imbibe and explore verticals on structured knowledge safely.
- To make students aware of different chemicals and their properties being used in the chemistry laboratory.

Learning outcomes

By the end of the course, the students will be:

- Able to design and implement safe working practices in chemistry laboratory.
- Able to safely handle different glass apparatus
- Able to handle the chemicals and equipment safely and properly.
- Able to design working protocols related to various methods and instruments in chemistry laboratory.

SYLLABUS

Practicals/ Hands-on Training: **(15 WEEKS)**

Part A: Safety Measures

1) Design an illustrative chart exhibiting creativity at transaction of Do's and Don'ts instructions for working in a chemistry laboratory.
2) i. Carry out Classification and labeling of the given set of chemicals based upon Globally Harmonized System.
   ii. Carry out detailed survey of the Chemical Abstract Service (CAS) Registry Number and identify the given set of CAS RN and explain the different sections of CAS RN.
3) Carry out preparation of the indicative MSDS (Material Safety Data Sheet) of given set of chemicals as per Standard MSDS format.
4) Design an illustrative chart exhibiting creativity at transaction of Common Safety Symbols along with its description. Associate appropriate safety symbol with each of the given set of chemicals.
5) Draw and elucidate the National Fire Protection Association Hazard Labels.

6) i. Identify and enlist the Incompatible Chemicals from a given set of chemicals available in the laboratory.
   ii. Carry out investigations on Labeling and storage of Chemical in laboratory.

7) i. On the basis of MSDS analysis, identify the required storage conditions for the given set of chemicals.
   ii. Describe procedure for the storage, maintenance and handling of compressed gas cylinders.

   iii. Explore guidelines for the Storage of shelf chemicals and reagents.

8) i. Carry out a brief review of common pathways by which working Chemicals can enter the Body.
   ii. Carry out a detailed study of the Limits of Exposure of given Chemicals.

9) i. Classify the Hazard based on storage, handling, and disposal of chemicals.
   ii. Identification and describe handling protocols for Substances with Greater Hazardous Nature.

10) Carry out detailed investigations on procedural protocols for safe Disposal of Chemicals.
11) i. Carry out study on recommended Safety and Emergency Equipment essential for the safe practices in a Chemistry Laboratory.
   ii. Study the guidelines in the Event of a Chemical Accident or Spill.

12) i. Write detailed description on Fire Safety in the laboratory.
   ii. Carry out investigations of the data regarding Institute Safety Policies: Safety Audits / Inspections.

Part B: Chemistry Lab Standard Operations

1) Carry out exploration on Holding, Handling and use of Common Laboratory Apparatus as per given list of laboratory apparatus (Appendix A).
2) Carry out investigations of various types of apparatus in labs based on material they are made of such as Pyrex Glass (borosilicate Glass) Apparatus, Fused Silica Apparatus: Corning Vycor Glass, Porcelain apparatus, Plastic Apparatus, Metal Apparatus.
3) Understanding the protocol of Cleaning and drying and polishing of Glassware apparatus.
4) Carry out detailed investigations on Identification, diagrammatic representation, set up of Apparatus assemblies and details exploration on operational procedural protocols for glassware apparatus with Interchangeable ground glass joints: Typical Assemblies.
5) i. Carry out calibration of Volumetric/ Graduated Glassware Apparatus along with description on Temperature Standards.
   ii. Carry out Calibration of thermometers.

6) i. Carry out exploration and investigations of working protocol for various heating equipment in laboratory: Burners, Hot Plates, Electrical Heating Mantles, Electric Oven, Microwave Oven, Muffle Furnace, Infrared lamps, Crucible and Beaker Tongs and Emersion heaters.
   ii. Carry out exploration and investigations of working protocol for various Stirring apparatus in laboratory: Stirring rods; Policeman, Boiling rods, Use of Mechanical agitation-Magnetic Stirrer and Mechanical Shaker.

   iii. Carefully analyze the Glass, Cork and Rubber Stoppers and investigate their preparation and appropriate applications.

7) i. Carry out detailed investigations of Heating and Cooling Bath, and determine their working ranges and working protocols.
   ii. Explore and differentiate between different forms of water for Laboratory Use: Distilled (Grade I to III), De-ionized and tap water, and carry out conductance measurement /other analytical

investigations for the differentiation purpose.

8) i. Differentiate among Various types of Filter Paper and explore their applications.
ii. Preparation of a fluted filter paper and its advantages.

iii. Classification of reagents as AR/ GR grade.

9) i. Care and Use of Analytical Balance: Mass and Weight, Two-Pan Balance and Electronic Balance.
ii. Carry out Calibration of weighing balances and accuracy in measurement.

10) Introduction to Chromatographic adsorption: Paper and Thin Layer Chromatography.
Preparation of Thin Layer Chromatography (TLC) Plates.

11) i. Use of melting point apparatus. Experimental determination of the melting point using various methods.
ii. Experimental determination of the boiling point using various methods.

12) To Purify given organic solvents.
13) i. Hand on training for working with typical assemblies of apparatus for distillation and refluxing.
ii. Assessment of Fire hazards attending the distillation of inflammable solvents.

14) i. Purification of given solid organic compounds by crystallisation method.
ii. Recrystallization of given non-volatile organic solids and outline the Difficulties encountered in recrystallization process.

15) Removal of traces of colouring matter and use of decolourising carbon.
16) i. Carry out exploration and investigations of working and working protocol for Filtration Apparatus: Filtration with suction.
ii. Explore and imbibe knowledge about types of Vacuum Pump; Water and Oil Pump and their applications.

17) Investigate Conventions for Drying of the recrystallized material.
18) i. Introduction to Gas absorption traps and their importance.
ii. Recrystallization in an atmosphere of inert gas.

19) i. Performing Evaporation of the solvent in the laboratory.
ii. Preparation of anhydrous liquids or solutions of organic compounds in organic solvents.

20) i. Various procedures for the precipitation and washing of the precipitates.
ii. Application of various methods and instruments for drying of solid organic compounds.

21) i. Incineration of Filter paper with precipitate.
ii. Differentiate between various types of centrifugation methods, principle, uses and application of centrifugation method.

iii. Calculation of yields for different chemical processes.

22) In-depth Understanding and Preparation of Chemical Laboratory Reagents.
23) Explore methodologies of Preparation and Storage of Standard Solutions.

Important Instruction Note on working approach:

A minimum of 5 exercises from Part A and 10 exercises from Part B is required to be discussed/performed/investigate. Moreover, exercises related to MSDS, CASRN safety symbols identification is required to be performed mandatorily.

Mandatory exercises:

Part A Exercise No.: 2, 3, 4, 5 and 9

Part B Exercise No.: 1 to 10.

The exercises mentioned above will be performed by the student strictly in accordance with the instructions received and only under the supervision of the teacher concerned.

References:

1. Skoog D.A., West D.M., Holler F.J., Stanley R.C., **Fundamentals of analytical chemistry**, 9th Edition, Cengage Learning.
2. Mendham, J.; Denney, R.C.; Barnes, J.D.; Thomas, M.J.K. (2007), **Vogel's Quantitative Chemical Analysis**, 6th Edition, Prentice Hall.
3. Furniss, B. S; Hannaford, A. J.; Smith, Peter W. G.; Tatchell, A. R; **Vogel's Text Book of Practical Organic Chemistry**, 5th Edition, Longman Scientific and Technical, Longman Group Ltd.
4. Garland, C. W.; Nibler, J. W.; Shoemaker, D. P. (2003), **Experiments in Physical Chemistry**, 8th Edition, McGraw-Hill, New York.
5. https://iupac.org/
6. https://edu.rsc.org/resources/practical/experiments

Chemistry of Cosmetics and Hygiene Products

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Chemistry of Cosmetics and Hygiene Products	**2**	**0**		**2**	XIIth Pass with Science	

Learning Objectives

- To introduce the concept of cosmetics in terms of chemistry and their formulation.
- To make students understand the role of each ingredients in the preparation of the cosmetic products.
- To give an idea about the role of herbal ingredients in the making of any cosmetic product.

Learning Outcomes

By the end of the course, the students will:

- Be familiar with the basic principles of various cosmetic formulations
- Be aware of different ingredients and their roles in cosmetic products.
- Appreciate the role of herbal ingredients in various cosmetic products
- Use safe, economic and body-friendly cosmetics
- Prepare new innovative formulations to achieve the aimed efficacies and effects

SYLLABUS

Practicals/Hands-on-training (15 WEEKS)

1. Definition, History and Classification of cosmetic & cosmeceutical products.

Skin Care Products: Basic structure and function of skin. Principles of formulation of skin care products. Role of herbs in Skin Care: Aloe and turmeric. General Ingredients and preparation of

(a) Preparation of Talcum powder (chemical based and herbal)

(b) Face cream/ vanishing cream/ cold cream/ suntan cream/lather shaving cream (any two)

(c) Body lotion

2. **Hair Care Products**: Basic structure of hair and classification of hair. Principles of formulation of Hair care products. Types of shampoo and conditioners. Role of herbs in Hair care: Henna and amla. Role of primary and secondary surfactants in shampoo. General Ingredients and preparation of

(a) Shampoo (chemical based and herbal)

(b) Conditioners

3. **Hand Care and hygiene Products**: Principles of formulation of hand sanitizers and hand wash. General Ingredients and preparation of:

(a) Hand wash

(b) Hand sanitizer

4. **Nail preparation**: Structure of nail, Nail lacquers, Nail polish remover. General Ingredients and preparation of:

(a) Nail polish and nail polish remover

5. **Personal hygiene products**: Total fatty matter, alkali content and pH of soaps. Bathing soap and toilet soap. Antiperspirants and deodorants. General Ingredients and preparation of

(a) Soaps

(b) Cream Soaps

6. **Oral hygiene products**: **Common problem associated with teeth and gums.Role of herbs in oral care: Neem and clove.** Principles of formulation of Oral hygiene products. Flavours and essential oils. General Ingredients and preparation of

(a) Tooth powder (chemical based and herbal)

(b) Tooth paste

References

1. Barel, A.O.; Paye, M.; Maibach, H.I. (2014), **Handbook of Cosmetic Science and Technology,** CRC Press.
2. Garud, A.; Sharma, P.K.; Garud, N. (2012), **Text Book of Cosmetics**, Pragati Prakashan.
3. Gupta, P.K.; Gupta, S.K. (2011), **Pharmaceutics and Cosmetics**, Pragati Prakashan
4. Butler, H. (2000), **Poucher's Perfumes, Cosmetic and Soap**, Springer

Additional Resources:

1. Flick, E.W. (1990), **Cosmetic and toiletry formulations,** Noyes Publications / William Andrew Publishing.
2. Natural Ingredients for Cosmetics; EU Survey 2005
3. Formulation Guide for cosmetics; The Nisshin OilliO Group, Ltd.
4. Functional Ingredients & Formulated Products for Cosmetics & Pharmaceuticals; NOF Corporation

Basic Analytical Techniques

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Basic Analytical Techniques	**2**	**0**	**0**	**2**	XIIth Pass with Science	NA

Learning Objectives

- To make students aware of the importance and the concepts of chemical analysis of water and soil samples collected from different sources
- To make them learn few techniques like chromatography, analytical techniques and instrumentation techniques, for example: spectrophotometry and flame photometry.

Learning Outcomes

By the end of the course, the students will be able to:

- Handle analytical data
- Determine the pH and conductance of soil samples, which can be useful in agriculture sector
- Do quantitative analysis of metal ions in water samples
- Separate ions using chromatographic techniques
- Estimate macronutrients using Flame photometry.

SYLLABUS

Practicals: (15 WEEKS)

1. Determination of pH of soil samples collected from college nursery, sports ground and the soil collected from Yamuna River Bank.
2. Determination of conductance of soil samples collected from college nursery and sports ground.
3. Determination of pH of different types of aerated drinks and fruit juices.
4. Estimation of Calcium and Magnesium ions as Calcium carbonate (total hardness) by complexometric titration.
5. Determination of pH, acidity, and alkalinity of water samples collected from different water body/supply sources like Yamuna water, MCD supply water, Groundwater, water samples collected from water sewage treatment plants (Delhi /NCR).
6. Determination of dissolved oxygen (DO) of a water sample collected from different sources (at least two sources).
7. Determination of BOD of water sample collected from different water sources.
8. Paper chromatographic separation (*ascending and circular both*) of the mixture of metal ion (Ni^{2+} and Co^{2+}) and (Cu^{2+} and Cd^{2+}).
9. To study the use of phenolphthalein in trap cases.
10. Estimation of macro-nutrients: Potassium, calcium and magnesium in soil samples by flame photometry.
11. Spectrophotometric determination of Iron in vitamin / dietary tablets / different solutions of iron.
12. Spectrophotometric identification and determination of caffeine and benzoic acid in soft drink.
13. Spectrophotometric determination of cadmium and chromium in the given water sample.
14. Determination of ion exchange capacity of anion / cation exchange resin (using batch procedure if use of column is not feasible).
15. Visit STP plants and different chemical industries.

References:

1. Svehla, G. (1996), **Vogel's Qualitative Inorganic Analysis**, Prentice Hall.
2. Mendham, J.; Denney, R.C.; Barnes, J.D.; Thomas, M.J.K. (2007), **Vogel's Quantitative Chemical Analysis**, 6th Edition, Prentice Hall.
3. De, A. K. (2021), **Environmental Chemistry**, 10th edition. New Age International Pvt. Ltd.

Note: Learners are advised to use the latest edition of readings.

Essential Food Nutrients

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Essential Food Nutrients	**2**	**1**	**0**	**1**	XIIth Pass with Science	NA

Learning Objectives

- To develop a basic understanding of the components of food, their source, properties and interactions as well as changes that occur during processing, storage, and utilization

Learning Outcomes

By the end of the course, the students will be able to:

- Account for chemistry of foods: composition of food, role of each component
- Recognize some of the reactions and changes in individual food components which occur during processing, handling and storage

SYLLABUS

Theory:

Unit 1: Carbohydrates (3 WEEKS)

Introduction, sources, functions, deficiencies, Structures of monosaccharides and disaccharides: glucose,

fructose, galactose; lactose, maltose, sucrose, maltitol, concept of reducing and non-reducing sugars; role of carbohydrates as sweeteners in food; lactose intolerance, galactosemia, dental plaque, overview of carbohydrate metabolism.

Unit 2: Lipids **(5 WEEKS)**

Introduction, sources, functions, deficiencies, classification (fatty acids, phospholipids, fats & oils, waxes), common fatty acids present in oils and fats, Omega- 3,6,9 fatty acids, trans fats, chemical properties: iodine value, saponification value, effect of frying on fats, changes in fats and oils- rancidity, lipolysis, flavor reversion, auto-oxidation and its prevention.

Unit 3: Proteins **(5 WEEKS)**

Introduction, sources, functions, deficiencies, protein structure (primary, secondary and tertiary), physico-chemical & functional properties of proteins, food proteins: animal and plant proteins.

Unit 4: Vitamins & Minerals **(2 WEEKS)**

Vitamins: Introduction, classification: fat-soluble vitamins & water-soluble vitamins.
Minerals: Introduction, classification: macrominerals (Ca, P, Mg) & microminerals (Se, Fe, I, Co, Zn, Cu, Se, Cr).
Role of vitamins and minerals in food chemistry.

Practicals/Hands-on Training **(15 WEEKS)**

1. Determination of moisture in food products by hot air oven-drying method.
2. Colorimetric determination of iron in vitamin/dietary tablets.
3. Estimation of Vitamin C in a given solution/lemon juice/chillies by 2, 6 Dichlorophenol indophenol method.
4. Estimation of total soluble sugar content by ferricyanide method (volumetric analysis).
5. Determination of saponification value of the given fat/oil.
6. Determination of iodine value of the given fat/oil.
7. Qualitative tests for proteins and carbohydrates.
8. Qualitative Estimation of cholesterol by Liebermann Burchard method.

References:

Theory:

1. deMan, J.M., Finley, J.W., Hurst, W.J., Lee, C.Y. (2018), **Principles of Food Chemistry**, 4th Edition, Springer.
2. Msagati, T.A.M. (2013), **Chemistry of Food Additives and Preservatives**, Wiley-Blackwell.
3. Fennema, O.R. (2017), **Food Chemistry**, 5th Edition, CRC Press.
4. Attokaran, M. (2017), **Natural Food Flavors and Colorants**, 2nd Ed., Wiley-Blackwell.
5. Potter, N.N., Hotchkiss, J.H, (1995) **Food Science,** 5th Ed., Chapman & Hall.
6. Brannen, D., Davidsin, P.M., Salminen, T. Thorngate III, J.H. (2002), **Food Additives**, 2nd Edition, CRC Press.
7. Coultate, T. (2016), **Food: The Chemistry of its Components**, 6thEdn., Royal Society of Chemistry.
8. Belitz, H. D.; Grosch, W. (2009), **Food Chemistry**, Springer.
9. Course: FOOD CHEMISTRY (iasri.res.in)

Practicals:

1. Ranganna, S. (2017). **Handbook of analysis and quality control for fruits and vegetable products**, 2nd Edn., McGraw Hill Education
2. Sawhney, S.K., Singh, R. (2001), **Introductory Practical Biochemistry**, Narosa Publishing House

Forensic Chemistry

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (ifany)
		Lecture	Tutorial	Practical/ Practice		
Chemical Aspects of Forensic Science	**2**	**1**	0	**1**	XII th Pass with Science	NA

Learning Objectives

- To introduce students to this fascinating branch of science and familiarize them with important concepts like fingerprints, explosives/arson, drugs and their detection.

Learning outcomes

By the end of the course, the students will be able to:

- Describe latent fingerprints, various methods of detection of latent fingerprints, explosive analysis in forensic science, collection and preservation of evidence from crime scene etc

SYLLABUS

Theory:

Unit 1: History of Development of Forensic Science in India (2 WEEKS)

Definitions, Scope and Need of forensic science, Ethics in forensic science, History of forensic science, Basic principles of forensic science, Organizational structure of forensic science laboratories, Different branches in forensic science

Unit 2: Fingerprints (5 WEEKS)

Definition, History of fingerprint identification, Fingerprint as forensic evidence, Visible Finger marks, Latent Finger marks, ten-digit classification, Methods of Development of latent fingerprints using

conventional methods–Powdering (Black and grey, fluorescent and magnetic), Methods of development of latent fingerprint using chemical method (iodine fuming, silver nitrate, Ninhydrin, Vacuum metal deposition), Automated Fingerprint identification system (AFIS), Poroscopy and Edgescopy

Unit 3: Forensic Chemistry (8 WEEKS)

Scope & significance of Forensic Chemistry, Types of cases/exhibits received for analysis. Trap Cases: Collection, and Preliminary analysis of evidence in trap cases.

Alcoholic Beverages: Types of alcohols, country made liquor, illicit liquor, denatured spirits, Indian made foreign alcoholic and non-alcoholic beverages.

Dyes: Scope & Significance of dyes in crime investigation, analysis of ink by TLC and UV visible spectrophotometry. Petroleum products and their adulterations: Chemical composition of various fractions of Petroleum Products, Analysis of petrol, kerosene, diesel.

Fire/Arson and Explosives Fire: Introduction to Fire & Arson, origin of fire, Chemistry of Fire, Fire tetrahedron,Firefighting operations, preservation of fire scene, collection of evidences, Seat of fire, cause of fire, motives, Analysis of fire debris, Case studies related to fire and Arson. Explosive and Explosion: Scope & significance of explosive analysis in forensic science, Types of explosives, deflagration and detonation, explosive trains, collection, preservation and forwarding of exhibits, preliminary analysis of explosives. Dos and Don'ts. Case studies related to explosives.

Drugs of abuse: Classification, including designer drugs. Ill effects of drugs of abuse, Preliminary and conformatory tests.

Practicals/ Hands-on Training (15 WEEKS)

1. Development of fingerprint through conventional powder method.
2. Development of fingerprint through chemical methods.
3. To check the alcohol presence in different liquor.
4. Phenolphthalein test for trap cases.
5. Identification of Handwriting Individual Characteristics.
6. Study of Disguise in handwriting.
7. TLC of amino acids

Essential/recommended readings

1. Saferstein, R. (1990) Criminalistics, Prentice Hall, New York.
2. Basic Principles of Forensic Chemistry by JaVed I. Khan • Thomas J. Kennedy Donnell R. Christian, Jr.
3. Fundamentals of FINGERPRINT ANALYSIS Hillary Moses Daluz
4. Clarke's Analysis of Drugs and Poisons 3rd Ed.

Green Methods in Chemistry

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (ifany)
		Lecture	Tutorial	Practical/ Practice		
Green Methods in Chemistry	**2**	**0**		**2**	XIIth Pass with Science	Basic understanding of Chemistry

Learning Objectives:

The learning objectives of this course are as follows:

- To create awareness about the chemistry that is good for human health and the environment.
- To provide thorough knowledge of the green chemistry principles, and new remediation technologies for the cleaning up of hazardous substances.
- To develop basic skills to be able to design, develop and run chemical processes in a sustainable way.

Learning Outcomes:

By the end of this course, students will be able to:

- Design and develop materials/ processes that reduce the use and generation of hazardous substances in industry.
- Describe how injudicious use of chemicals can have an adverse/potentially damaging effect on humans and the environment.
- Propose ideas for innovative approaches to environmental and societal challenges.
- Critically analyse the existing traditional chemical pathways/processes and creatively think about bringing environmentally benign reformations in these protocols.
- Convert biomass into valuable chemicals through green technologies.

SYLLABUS

Practicals/Hands-on Training **(15 WEEKS)**

1. Definition and Importance of green chemistry. Introduction to the prevention of waste/ by products and waste/ pollution prevention hierarchy. Provide the scheme for the traditional as well as green method for the synthesis of ibuprofen and ask students to compare the amount and hazards of waste generated in both

the processes.

2. Principle and calculation of atom economy. Use of molecular model kit to stimulate the reaction to investigate how the atom economy can illustrate Green Chemistry.

Preparation of propene by two methods can be studied

(I) Hoffman elimination

(II) Dehydration of propanol

The other types of reactions, like addition, elimination, substitution and rearrangement should also be studied for the calculation of atom economy

3. Prevention/ minimization of hazardous/ toxic products reducing toxicity. Risk = (function) hazard x exposure.

(a) Nitration of salicylic acid using green method $Ca(NO_3)_2$

(b) Preparation and characterization of nanoparticles of gold using tea leaves/silver nanoparticles using plant extracts.

(c) Preparation of dibenzalacetone by cross aldol condensation reaction using base catalysed green method

(d) Acetylation of primary aromatic amine using the green method.

4. Use of Green solvents and comparison of greenness of solvents:

(a) Explain about supercritical fluids with special reference to carbon dioxide. Extraction of D-limonene from orange peel using liquid CO_2 prepared from dry ice

(b) Introduction to water as a solvent for chemical reactions. preparation of Manganese (III) acetylacetonate using green method

(c) Advantages and application of solventless processes in organic reactions.

(i) Benzil- Benzilic acid rearrangement in solid State under solvent-free Condition.

(ii) Mechanochemical solvent free, solid–solid synthesis of azomethine using *p*- toluidine and *o*-vanillin/*p*-vanillin

5. Energy requirements for reactions – alternative sources of energy: use of microwaves and photochemical energy.

(a) Photoreduction of benzophenone to benzopinacol in the presence of sunlight.

(b) Microwave assisted ammonium formate-mediated Knoevenagel reaction: *p*-anisaldehyde, ethyl cyanoacetate, ammonium formate.

6. Selection of renewable starting material rather than depleting, Illustrate with few examples such as biodiesel and polymers from renewable resources (such as green plastic). Preparation of biodiesel from waste cooking oil and characterization.

7. Importance of using catalytic reagents in preference to stoichiometric reagents; catalysis and green

chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis.

(a) Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide

(b) Rearrangement of diazoamino benzene to *p*-aminoazo benzene using K10 montmorillonite clay

8. Students should be asked to prepare a presentation/project based on any of the following topics:

- Bhopal Gas Tragedy and safer route to carbaryl synthesis
- Flixiborough accident and safer route to cyclohexanol
- Use of Surfactants for SC-CO_2 for precision cleaning and dry cleaning of garments replacing PERC.
- A brief study of Green Chemistry Challenge Awards (Introduction, award categories and study about five last recent awards
- Healthier Fats and oils by Green Chemistry: Enzymatic Interesterification for production of No Trans-Fats and Oils.
- Synthesis of anti-tuberculosis drug Paramycin from waste water stream
- Syntheses of vitamin D_3 using photochemical energy
- Greener Manufacturing of Sitagliptin Enabled by an Evolved Transaminase
- Microwave assisted solvent free synthesis of aspirin
- Synthesis of 6-Aminopenicillanic Acid (6-APA) from penicillin G using biocatalyst.

References:

Theory:

1. Anastas, P.T., Warner, J.C. (2014), **Green Chemistry, Theory and Practice**, Oxford University Press.
2. Lancaster, M. (2016), **Green Chemistry: An Introductory Text**, 3rd Ed., RSC Publishing.
3. Cann, M.C., Connely, M. E. (2000), **Real-World cases in Green Chemistry**, American Chemical Society, Washington.
4. Matlack, A.S. (2010), **Introduction to Green Chemistry**, 2nd Ed., CRC Press.
5. Alhuwalia, V.K.; Kidwai, M.R. (2012), **New Trends in Green chemistry**, Kluwer Academic Publishers, Springer.
6. Sidhwani, I.T; Sharma, R.K. (2020), **An Introductory Text on Green Chemistry**, Wiley India Pvt Ltd.
7. Etzkorn, F. A . (2019), **Green Chemistry: Principles and Case Studies**, Royal Society of Chemistry.

Practicals:

1. Kirchoff, M., Ryan, M.A. (2002), **Greener approaches to undergraduate chemistry experiment**, American Chemical Society, Washington DC.
2. Sharma, R.K., Sidhwani, I.T., Chaudhari, M.K. (2013), **Green Chemistry Experiments: A monograph**, I.K. International Publishing House Pvt Ltd. New Delhi.
3. Pavia, D.L., Lamponam, G.H., Kriz, G.S.W. (2006), **Introduction to organic Laboratory Technique- A Microscale approach**, 4th Edition, Brooks-Cole Laboratory Series for Organic chemistry.
4. Sidhwani, I.T. ; Saini, G.; Chowdhury, S. **Wealth from Waste: A green method to produce biodiesel from waste cooking oil and generation of useful products from waste further generated**. University of Delhi, Journal of Undergraduate Research and Innovation, Volume 1, Issue 1, February 2015, ISSN: 2395-2334.
5. Sharma, R. K., Gulati, S., Mehta, S. (2012), **Preparation of Gold Nanoparticles Using Tea: A Green Chemistry Experiment,** Journal of Chemical Education, 89 (10), 1316-1318.

Lab Testing and Quality Assurance

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (ifany)
		Lecture	Tutorial	Practical/ Practice		
Lab Testing and Quality Assurance	2	1	-	1	XIIth Pass with Science	Basic understanding of chemistry

Learning Objectives:

The objective of this course is :

- To introduce the concept of quality check and quality control in chemical industries.

Learning Outcomes:

By the end of the course, the students will be able to:

- Describe role of quality control chemist
- Discuss and demonstrate analytical and separation techniques
- Carry out sample preparation
- Illustrate fundamentals of quality check
- Describe and use safety procedures

SYLLABUS

Unit 1: Introduction **(2 WEEKS)**

Industry and sub-sectors, standards for manufacturing in life-sciences, drug regulatory agencies, role of quality control chemist, quality management systems

Unit 2: Modern Analytical methods and separation techniques **(5 WEEKS)**

Gravimetric methods, volumetric methods, electroanalytical methods, spectroscopic methods, chromatographic techniques

Unit 3: Sample preparation **(2 WEEKS)**

Basics of sample preparation, preservation and storage, standards and guidelines for sample handling, good storage practices

Unit 4: Quality check **(6 WEEKS)**

Overview, productivity concept, statistical analysis of laboratory data, measurements, calibrations, validation, reference standards and materials, requirements of a calibration lab, fundamentals of advanced QC approaches, Trouble shooting in QC, documentation, audit/ process related query, Quality certifications, Government regulations in industries like pharmaceuticals, food supplements, cosmetics.

Practicals/Hands-on-Training (15 WEEKS)

1. Calibration of glassware
2. Weighing of samples, accuracy of measurements
3. Preparation of TLC plates and separation of amino acids
4. Working protocols of various laboratory instruments-oven, pH-meter, conductivity meter, water baths, muffle furnace, spectrophotometer.
5. Calibration of instruments like colourimeter, pH-meter, conductivity meter, spectrophotometer using reference standards or reference materials.

Suggested exercise: Visit some industries to study the validation of simple procedures.

References:

1. Skoog D.A., West D.M., Holler, F.J., Crouch S.R., **Fundamentals of Analytical Chemistry**, 9th Edition, Cengage learning.
2. **Quality control chemist participant manual** prepared by LSSSDC in collaboration with NSDC India.
3. iso.org

Chemistry of Food Flavors and Colourants

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (ifany)
		Lecture	Tutorial	Practical/ Practice		
Chemistry of Food Flavors and Colourants	**2**	**1**	-	**1**	XIIth Pass with Science	Basic understanding of chemistry

Learning Objectives:

The learning objectives of this course are as follows:

- To provide introduction to quality attributes of food such as appearance and flavour.
- To impart an understanding of the chemistry of the flavour as well as colour constituents of foods.

Learning Outcomes:

By the end of the course, the students will be able to:

- Describe mechanisms of flavor perception
- Demonstrate various mechanisms of flavor formation
- Discuss the chemical dimension of flavour.
- Recognize off-flavor defects in foods and strategies to control it.

SYLLABUS

Unit 1: Flavors (9 WEEKS)

Introduction and importance of flavors in food.
Taste & Odour: Structure and physiology of taste organs- tongue, papillae, taste buds, salivary glands, Mechanism of taste and odour perception
Basic Types of taste : Salty, Sweet, Bitter, Sour, Umami taste, Chemical dimensions of basic tastes (sweet, salt, sour, bitter and umami), odour and other sensations (like astringency, coolness, pungency/pungency), Non-nutritive and nutritive sweeteners (including structures of aspartame, saccharin, sucralose, Stevioside), Molecular Theory of Sweetness, Taste Inhibition and enhancement, Chemical dimension of Flavors (peppers, peppermint, coriander, cinnamon, onion), Chemistry of food flavorings: Maillard browning, enzymic browning reactions, caramelisation browning, Off-Flavour in Food (Rancidity in Fats/Oils, Non Enzymic Browning), Control of enzymic browning (acidulants, chelating agents, heat treatment etc)

Unit 2: Food Colours (6 WEEKS)

Introduction, importance, classification: Natural food colourants (Anthocyanins, Carotenoids, Chlorophyll), Examples of Pigments in common food (turmeric, tomato, carrot, orange); Nature-identical colourants (β-Carotene, Canthaxanthin and Riboflavin); Artificial/synthetic colourants: Azo dyes (e.g. amaranth dye, tatrazine, citrous red); Quinoline (e.g. quinoline yellow); Phthalein (e.g. erythrosine); Triarylmethanes and indigoid (e.g. indigo carmine), FD&C Dyes and Lakes.

Practicals/Hands-on-Training **(15 WEEKS)**

1. Determination of the taste threshold for the different sensations – sweet, salty, sour.
2. Extraction of limonene from orange peels using supercritical carbon dioxide.
3. Quantitative determination of food dyes in powdered drink mixes by spectrophotometric method.
4. Extraction and separation of pigments present in spinach by Thin Layer Chromatography (TLC).
5. Experiment to demonstrate the enzymic browning and its prevention.
6. Determination of rancidity of edible oils by Kriess Test.
7. Estimation of carotenoids in sample by colorimetric method.

References:

Theory:

1. DeMan, J.M., Finley, J.W., Hurst, W.J., Lee, C.Y. (2018), **Principles of Food Chemistry**, 4th Edition, Springer.
2. Msagati, T.A.M. (2013), **Chemistry of Food Additives and Preservatives**, Wiley-Blackwell.
3. Fennema, O.R. (2017), **Food Chemistry**, 5th Edition, CRC Press.
4. Attokaran, M. (2017), **Natural Food Flavors and Colorants**, 2nd Ed., Wiley-Blackwell.
5. Potter, N.N., Hotchkiss, J.H, (1995) **Food Science,** 5th Ed., Chapman & Hall.
6. Brannen, D., Davidsin, P.M., Salminen, T. Thorngate III, J.H. (2002), **Food Additives**, 2nd Edition, CRC Press.
7. Coultate, T. (2016), **Food: The Chemistry of its Components**, 6th Edn., Royal Society of Chemistry.
8. Belitz, H. D.; Grosch, W. (2009), **Food Chemistry**, Springer.
9. Course: FOOD CHEMISTRY (iasri.res.in)

Practicals:

1. Ranganna, S. (2017). **Handbook of analysis and quality control for fruits and vegetable products**, 2nd Edn., McGraw Hill Education
2. Sawhney, S.K., Singh, R. (2001), **Introductory Practical Biochemistry**, Narosa Publishing House

PCB Designing and Fabrication

CREDIT DISTRIBUTION, ELIGIBILITY AND PREREQUISITES OF THE COURSE

Course title& Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		

PCB Designing and Fabrication	**2**	**-**	**-**	**2**		**Basic Knowledge of Electronics**

Course Learning Objectives

The Learning Objectives of the course are as follows:
The main objective of this course is to give a comprehensive understanding and hands-on exposure to the various processes, industrial tools, protocols, and design specifics which are involved in PCB Designing so that the students can design an electronic printed circuit board for a specific application using industry-standard software after going through the complete procedural steps of developing circuit schematic, board files, image transferring, assembly, soldering, and testing.

Course Learning Outcomes

The Learning Outcomes of the course are as follows:

- Familiarization of the various types of devices/components that may be mounted on PCB
- Understanding of the PCB layout techniques for optimized component density and power saving.
- Pre-requisite knowledge to perform design and printing of PCB with the help of various image transfer and soldering techniques
- Understanding of the current trends and scope of the PCB industry

(Semester-I)

Syllabus Contents

Unit-I: PCB Fundamentals **(3 Weeks)**
PCB Advantages, components of PCB, Electronic components, Microprocessors and Microcontrollers, IC‘s, Surface Mount Devices (SMD). Classification of PCB - single, double, multilayer, and flexible boards, Manufacturing of PCB, PCB standards.

Unit-II : Schematic & Layout Design **(4 Weeks)**
Schematic diagram, General, Mechanical, and Electrical design considerations, Placing and Mounting of components, Conductor spacing, routing guidelines, heat sinks and package density, Net list, creating components for a library, Tracks, Pads, Vias, power plane, grounding.

Unit-III : PCB Design Processes **(5 Weeks)**
Design automation, Design Rule Checking; Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins, copper-clad laminates materials of copper-clad laminates, properties of laminates (electrical & physical), types of laminates, soldering techniques. Film master preparation, Image transfer, photo printing, Screen Printing, Plating techniques, Etching techniques, Mechanical Machining operations, Lead cutting and Soldering Techniques, Testing, and quality controls.

Unit-IV : PCB Technology **(3 Weeks)**
Introduction of PCB prototyping machines, Schematic Entry, PCB Parts creation, Auto Routing, Post Design, Brief overview of various models available, Recent Trends, and environmental concerns in the PCB industry.

List of Practicals/Exercises

PCB Designing, Fabrication, Component Mounting and Testing using Standard Procedures (Hardware)

A. Analog Electronic Circuits

1. Verification of Thevenin theorem
2. Designing of RC Low Pass Filter and High Pass Filter circuits
3. To study current-Voltage characteristics of a p-n junction diode (forward bias and reverse bias)
4. Designing of Centre tapped full wave rectifier – without and with shunt capacitance filter.
5. Simple circuit to glow an LED
6. Design, fabrication, and testing of a 9 V power supply with Zener regulator
7. Design and study of voltage divider biasing.
8. Designing of a CE based amplifier of given gain

B. Digital Electronic Circuits

1. To verify and design AND, OR, NOT and XOR using NAND gates
2. Design a Half adder and Full Adder
3. Design a Half Subtractor and Full Subtractor

PCB Design Softwares recommended

- KiCAD (Open Source Electronics Design Automation Suite) https://www.kicad.org/
- EasyEDA (Online PCB Design Tool) https://easyeda.com/
- PADS - Siemens EDA (PCB Design Software) https://eda.sw.siemens.com/en-US/pcb/pads/
- Any other similar PCB designing software

Essential/recommended readings

1. Printed Circuit Board – Design & Technology, Walter C. Bosshart, Tata McGraw Hill, 2008.
2. Printed Circuit Board –Design, Fabrication, Assembly & Testing, R.S. Khandpur, First Edition, Tata Mcgraw-Hill Education Pvt. Ltd., 2005.
3. Printed Circuit Board Design Using Autocad, Chris Schroeder, Newnes Publisher, 1998.
4. Printed Circuits Handbook, Clyde F. Coombs, Jr, Happy T. Holden, Sixth Edition, Publisher: McGraw-Hill Education, 2016.

Examination scheme and mode:

Total Marks: 100

Internal Assessment: 25 Marks
Practical Exam (Internal): 25 Marks
End Semester University Exam: 50 Marks
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

Electronic Product Testing

CREDIT DISTRIBUTION, ELIGIBILITY AND PREREQUISITES OF THE COURSE

Course title& Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Electronic Product Testing	**2**	**-**	-	**2**		---

Course Learning Objectives

The Learning Objectives of the course are as follows:

The objective of teaching this subject is to enable students for testing of various electronic and electrical components and instruments such as diode, transistor, transformer, switches, fuses, cables, CRO, multimeters, voltmeter, ammeters etc. Further this subject will give an insight upon the SMD and its soldering and de-soldering, EDS. The subject will help students to have insight knowledge of SMPS, UPS and batteries along with maintenance of consumer electronics gadgets like computers, Audio Amplifiers, Induction Top, Solar Panel etc. This in turn will enhance their capabilities of assembling, fault diagnosis and rectification in a systematic way. The subject will enrich students about reliability and quality control standards of equipment.

Course Learning Outcomes

The Learning Outcomes of the course are as follows:

- Test different types of electronic and electrical components and instruments.
- Practice soldering and de-soldering processes with correct methods.
- Testing of SMPS, UPS, Inverters and batteries.
- Identify faults in consumer electronics gadgets such as audio amplifiers, computers, Induction top, Microwave, solar panel.

(Semester I)

Syllabus Contents

Unit 1 : Introduction **(4 Weeks)**

Overview of Basic Measuring Instruments: CROs, Multimeter, Power supplies, LCR meter, Signal Generator and Power Analyzer.

Testing of various Devices: a) Semiconductor Devices: Single and Two junction Devices, Thyristor b) Electrical Devices: Transformers, relays, switches and fuses, cables and connectors, Batteries, Idea about ICs, PCBs, Sensors.

Unit II : Soldering and Power Sources **(4 Weeks)**

Basics of soldering: Soldering tools and materials (solder, flux), Types of soldering irons (Wattage,

temperature, Tips), Soldering/ disordering station. Concept of ESD (Electrostatic discharge). The SMD (surface mounted Devices) and its soldering and de-soldering

Basics of SMPS (Switch Mode Power Supply), UPS (Uninterrupted power supply), batteries and Inverters along with their block diagram and Pin configuration of some important ICs used in it. Touch current and touch voltage.

Unit III : Appliance Testing and Computer Assembling (3 Weeks)

Testing of Induction cook Top, microwave, Solar panel; Installation and Requirements, stand alone and Grid connected PV system.
Basics of computer assembling and testing. Brief description about its specifications and costing Factors.

Unit IV : Reliability and Quality Standards (4 Weeks)
Concept of Reliability: Scope, objectives and factors influencing equipment effectiveness, Acceptance Testing, Type Testing , Safety Testing, Identification of legends, symbols, color codes, Safety, safety standards, safety certificates (CE, UL and VDE), General awareness of quality standards, quality management systems &documentation, Idea of ISO 17025, ISO 9001,Calibration and Uncertainty of measurements, Effect of environmental testing(refer to IEC60068-1 for guidance), Awareness on disposal of Electronic waste

Hardware Practicals

1. An overview of testing of basic electronic / electrical components (BNC cable, switches and fuses, Capacitors, Inductors, Transformers, Relays, diodes, transistor, Thyristor, IC, Potentiometer etc.); Design a curve tracer on CRO for component testing.
2. Control the intensity and color of bi-Color LED with the help of POT, SPDT switch and 9V battery.
3. Soldering and De-soldering processes; SMD
4. Safety testing of SMPS (Applicable Standard: IS 14886.
    a. Safety Testing (Earth Leakage current Test, Dielectric Test, Short Circuit Protection)
    b. Performance Testing (Line Regulation, Load Regulation for a variation of Load Min to Max load and vice versa, Efficiency at nominal input and rated load)
5. Tubular Batteries (Applicable standard: IS 1651) Test for Capacity, Test for voltage during discharge
6. Personal Computer (Applicable Standard: IS 14896)
    a. Safety Testing (Earth Leakage current Test, Dielectric Test) Performance Testing (Microprocessor used,
    b. RAM expansion Capacity, Clock Rate and RAM Capacity, Effect of Power Supply variations)
7. Invertor (Applicable Standard: IS 13314)
    a. Visual Inspection, High Voltage Test, Insulation Resistance Test, No –Load Test, Output Test
8. UPS (Applicable Standard: IEC 62040-3)
    a. Steady State Input Voltage Tolerance, Output-Normal Mode – No Load, Output-Normal Mode – Full Load, Output-Stored Energy Mode – No Load, Output- Stored Energy Mode – Full Load, Output-Normal Mode – Over Load, Output-Stored Energy Mode – Over Load Output-Normal Mode – Short Circuit, Output- Stored Energy

Mode – Short Circuit, Efficiency and Input Power factor

9. Audio Amplifier (Applicable Standard: IEC 60065)
    a. Audio frequency response at various power levels, Response to various inputs sources like DVD player, IPOD, CD player, etc., audio output power, Power Consumption, Voltage range
10. Solar Panel system: Testing and Efficiency

References/Suggested Readings

1. Nutan Kala Joshi and Swati Nagpal, Basic Electronics with Simulations and Experiments, Khanna Publishers (2021)
2. Jesting Yong, Testing Electronic Components (2007)
3. Mark de Vinck, Make Getting Started with Soldering; A Hands-on Guide to Making Electrical and Mechanical Connections, Maker Media (2017)
4. Mike Judd and Keith Brindley, Soldering in Electronics Assembly, Second Edition, Elsevier (1999)
5. Jestine Yong, Troubleshooting Repairing Switch Mode Power Supplies (1995)
6. David Griffith, Uninterruptible Power Supplies, CRC Press (1989)
7. Thomas Reddy, Lindens Handbook of Batteries, 4th Edition, McGraw Hill
8. Kevin Wilson, Essentials Computer Hardware; The Illustrated Guide to Understanding Computer Hardware, Elluminet Press (2018)
9. N.S. Reddy, PC Hardware Maintenance and Troubleshooting, NEO Publishing House (2016)
10. Handbook of Induction Heating Second Edition Valery Rudnev, Don Loveless, Raymond L. Cook, CRC Press Taylor & Francis Group (2017)
11. R. G. Gupta, Audio and Video systems, Tata McGraw Hill (2004)
12. A.R. Jha, Solar Cell Technology and Applications, CRC Press (2009)
13. Statistical Applications in Process Control (Quality and Reliability), J. Bert Keats, Douglas C. Montgomery, CRC Press (1996)
14. Reliability and Quality Management , Ankitsandilya (Author), R.C.Mishra , New Age International Private Limited. (2009)
15. E-Waste Management Challenges and Opportunities in India, Varsha Bhaga Ganguly, Routledge India (2021)

Examination scheme and mode:

Total Marks: 100
Internal Assessment: 25 Marks
Practical Exam (Internal): 25 Marks
End Semester University Exam: 50 Marks
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

CULINARY SCIENCE

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/ Practice		
Culinary Science	2	1	0	1	Class XII Pass	NIL

LEARNING OBJECTIVES:

Culinary science skill paper is about the cuisine arts of food preparation, cooking, and presentation of food. Students will be equipped with knowledge of various tools and equipments used for cooking, different cooking techniques, working in establishments such as restaurants and relatively large institutions such as hotels and hospitals, standardized cooking practices and recipes.

The learning objectives of the course are:

- To develop cuisine arts of food preparation, cooking, and presentation of food.
- The practical exercises aim to provide hands-on training to develop the skill of various cooking techniques and knowledge about various tools and equipment used for cooking

LEARNING OUTCOMES:

- The students will develop different cooking and presentation skills.
- The students will get hands-on training to develop the skill to prepare Indian traditional and nutritious recipes.
- They will develop the ability to work in establishments such as restaurants, food courts, kiosks, fast food centers large institutions such as hotels and hospitals.

SKILL DEVELOPMENT AND JOB OPPORTUNITIES':

Employment Opportunities:

- Apprentice in Small Catering units/ Kiosk/ Restaurant
- Food Supplier
- Food Storekeeper
- Food Stylist / Designer

SYLLABUS

Credits: 2 **Total lectures (45): 45 Hours/ 15 weeks**
Theory: 30%, Credit – 1 (Lectures – 15)
Practical/ Field work/ Hands on learning: 70%, Credit – 1 (Lectures – 30)

Unit I: Basic Culinary Concepts **(8 weeks)**

Description: This unit is an introductory unit about the culinary science and basic food ingredients, importance of hygiene to serve safe food.

Subtopics:

- Culinary Terms
- Basic Safety and Hygiene
- Basic food ingredients
- Recipe Evaluation: Sensory evaluation scales

Unit II: Kitchen Techniques and Technology **(7 weeks)**

Description: This unit is about methods of cooking, storage and organizing the storage and imparting knowledge about various kitchen equipment and accessories.

Subtopics:

- Methods: Moist heat, Dry heat, Frying, Microwave Cooking
- Basic Equipment: Gas stove/Cooking range, Refrigerator, Oven, Microwave, Electrical Blenders, Air Fryer
- Kitchen Aids: Cooking Equipment, Measuring Equipment, Baking Equipment, Assorted Knives, Assorted tools, Service Equipment.
- Storage and organization of work area

PRACTICALS

No. of Students per Practical Class Group: 10-15

1. General Instructions: Working in Food Lab/ Kitchen, Weight of edible portion, Temperature, Abbreviations used in recipes **(1 week)**
2. Basic Indian Gravies: White, Makhani, Salan, Red gravies, Kadi **(1 week)**
3. Beverages: Tea, Coffee, Cold Coffee, Smoothies, Milk Shakes, Fruit Punch, Iced Tea, Panna, Mojito. **(1 week)**
4. Indian Breads: Chapatti, Paratha, Naan, Kulcha, Bhatura, Bedmi Puri, Sandwich (open, grilled, rolled), Puranpoli, Kathi roll. **(1 week)**
5. Indian Rice Cooking: Boiled, Curd, Tomato, Lemon, Fried, Pulao, Tamarind, Biryani, Poha **(1 week)**
6. Soups: Stock, Clear soups, Cream soups **(1 week)**
7. Salads and Salad cuts/ craft: Coleslaw, Quinoa salad, Corn &Walnut, Exotic seeds salad, Salad vegetable cuts and crafts **(1 week)**
8. Vegetables Preparations: Dry veg, Koftas, Stuffed veg, Baked veg preparations. **(1 week)**
9. Indian Dry Snacks with Dips: Dhokla, Idli, Uttapam, Kachori, Khandvi, Chilla, Dumplings, (Momos/Dim sums/ wontons) **(2 weeks)**
10. Indian Savory Snacks: Assorted Pakoras, Dahi Bhalla, Cutlets, Samosa, Tikki, Paneer Tikka **(2 weeks)**
11. Traditional Deserts 1: Halwa, Kulfi, Kheer, Gulab Jamun **(1 week)**
12. Traditional Deserts 2: Rasmali, Ladoo, Burfi, Jalebi, Gujia, Rasgulla **(1 week)**
13. Baking: Tea cake, Muffins **(1 week)**

ESSENTIAL READINGS

1. Raina, U., Kashyap, S., Narula,V., Thomas, S., Suvira, Vir, S., & Chopra, S. (2005). Basic Food Preparation – A Complete Manual. Delhi: Orient Longman.
2. Khanna, K., Gupta, S., Seth, R., Mahana, R., & Rekhi, T. (2004). The Art and Science of Cooking. Delhi: Phoenix Publishing House Private Limited.
3. Arora, K. (2011). New Delhi: Theory of Cooking. Frank Bros & Co.

SUGGESTED READINGS:

1. Kumar, B. (2021). Theory of Culinary Arts. Rudra Publications
2. Sethi, P. & Lakra, P. (2015). Aahar Vigyan, Poshan Evam Suraksha. Delhi: Elite Publishing House Pvt. Ltd.
3. Suri, S. & Malhotra, A. (2014). Food Science Nutrition and Safety. Delhi: Pearson India Ltd.

EXAMINATION SCHEME AND MODE:*(as per university guidelines)*

TotalMarks:100
Internal Assessment: 12 marks
End Semester University Theory Exam: 38 marks
Practical Exam: 50 marks
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

CHOCOLATE CRAFTS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/ Practice		
Chocolate Crafts	2	1	0	1	Class XII Pass	NIL

LEARNING OBJECTIVES:

This Skill Enhancement Course enables student to understand the basic principles, hygiene and precautions of chocolate cookery. The emphasis of this will be to develop the skill required for preparation of various chocolates and its packaging and marketing.

The learning objectives of the course are:

- To learn the skill to craft different types of chocolates
- To learn the basic principles, hygiene and precautions of chocolate crafting and entrepreneurship in chocolate industry.

LEARNING OUTCOMES:

- The students will have the understanding of different chocolates and acquire the skill to handle them.
- They will develop the abilities and showcase skills for preparation of molded, center filled, free hand cluster, chocolate accessories, garnishes and ancillary chocolate recipes
- The students will get acquainted with techniques of packaging, costing and marketing of chocolates.
- The students will gain knowledge and skill to start small scale chocolate enterprise

SKILL DEVELOPMENT AND JOB OPPORTUNITIES':

Employment Opportunities:

- Apprentice in Small Catering units/ Kiosk/ Restaurant
- Entrepreneurship in chocolate industry
- Food Stylist / Designer

SYLLABUS

Credits: 2 **Total lectures (45): 45 Hours/ 15 weeks**
Theory: 30%, Credit – 1 (Lectures – 15)
Practical/ Field work/ Hands on learning: 70%, Credit – 1 (Lectures – 30)

THEORY

Unit I: Introduction to Chocolates **(7 weeks)**

Description: The focus of this unit is on chocolates, various aspects of chocolate processing and learning the precautions to make good chocolates.

Subtopics:

- Chocolates: history and types of compound and couverture chocolates.
- Processing of cocoa bean to manufacture chocolate liquor, cocoa butter, cocoa powder, chocolate and chocolate chips.
- Precautions and hygiene practices while handling chocolate.

Unit II: Applications of Chocolates **(8 weeks)**

Description: The focus of this unit is on using the chocolates to make different products, understanding and rectifying the faults.

Subtopics:

- Molded, center filled, free hand clusters, garnishes and accessories.
- Recipe development, costing and packaging of chocolates.
- Faults in chocolates like sugar bloom and fat bloom, their reasons and correction. temperature and moisture control while handling chocolate.

PRACTICALS

No. of Students per Practical Class Group: 10-15

1. Introduction to different kinds of chocolates: Compound and Couverture; their sensory analysis and mouth feel. **(1 week)**
2. Market survey of Indian and Internationally made chocolates with respect to label reading (ingredients). **(1 week)**
3. Equipment's (molds, scrapers, piping bags, nozzles, cooking thermometers, microwave, double boiler) and precautions to be used in handling chocolate. **(1 week)**
4. Making molded compound chocolate. **(1 week)**
5. Variations of molded chocolates. **(1 week)**
6. Making center filled chocolate. **(1 week)**
7. Variations of center filled chocolate **(1 week)**
8. Making free hand chocolate clusters. **(1 week)**
9. Making chocolate accessories and garnish. **(2 week)**

10. Ancillary chocolate recipes like chocolate sauce, ganache and hand rolled truffles. **(1 week)**
11. Tempering of couverture chocolate. **(1 week)**
12. Packaging and labeling of chocolates. **(1 week)**
13. Visit to chocolate factory or chocolate exhibition and sale trial. **(2 week)**

ESSENTIAL READINGS

- Afoakwa E.O. (2013). Chocolate Science and Technology, Wiley India Pvt Ltd, 978-8126545735.
- Beckette S.T. (2018). The Science of Chocolate, Royal Society of Chemistry, 978-1788012355.
- Minifie B.W. (1999). Chocolate, Cocoa and Confectionary, Aspen Publication. 978-0834213012.
- Manay, S. & Shadaksharaswamy, M. (2020). Foods: Facts and Principles, New Age Publishers. 978-8122422153.
- Panda, H. (2012). Technology of Confectionery, Chocolates, Toffee, Candy, Chewing & Bubble Gums, Lollipop and Jelly Products with Formulations, Engineers India Research Institute publisher. 978-9380772165.

SUGGESTED READINGS:

- Hodge N. (2018). The Art and Craft of Chocolate, Quarry Books, 978-1631594663.
- Perry S. (2008). Deep Dark Chocolate, Chronicle Books. 978-0811860895.
- Panda, H. (2017). Start Your Own Confectionery and Chocolate Products with Manufacturing and Formulations Hand Book, Bio-Green Books publisher. 978-9380772844.
- Greweling, P.P. (2012). Chocolates and Confections: Formula, Theory, and Technique for the Artisan Confectioner, The Culinary Institute of America (CIA), Wiley; 2nd edition, 978-0470424414.
- Shaffer, K. (2019). Chocolate for Beginners: Techniques and Recipes for Making Chocolate Candy, Confections, Cakes and More, Rockridge Press Publishers, 978-1641528887.

EXAMINATION SCHEME AND MODE:*(as per university guidelines)*

TotalMarks:100
Internal Assessment: 12 marks
End Semester University Theory Exam: 38 marks
Practical Exam: 50 marks
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty

PASTA AND PATISSERIE TECHNOLOGY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/Practice		
Pasta And Patisserie Technology	2	1	0	1	Class XII Pass	NIL

LEARNING OBJECTIVES:

This Skill Enhancement Course is about developing an understanding and skill about the types, role of ingredients, processing/production, innovations, sensory attributes and quality assessment of Pasta and Patisserie. The student can also study SEC on Bakery Enterprise, Food Business and Cafeteria Management to enhance scope of work opportunities.

The learning objectives of the course are:

- To provide students with basic knowledge of pasta technology.
- To familiarize students with patisserie technology/ skill.

LEARNING OUTCOMES:

- The students will develop understanding of the pasta and patisserie technology.
- They will acquire skill to prepare different pasta and patisserie.
- Students can work in specialized pasta and patisserie outlets such as restaurants, food courts, kiosks, fast food centers as well as in large institutions such as hotels, hospitals and food processing units.

SKILL DEVELOPMENT AND JOB OPPORTUNITIES':

Employment Opportunities:

- Apprentice in Small Catering units/ Kiosk/ Restaurant
- Entrepreneurship in pasta and patisserie technology
- Food Stylist / Designer for pasta and patisserie

SYLLABUS

Credits: 2 **Total lectures (45): 45 Hours/ 15 weeks**
Theory: 30%, Credit – 1 (Lectures – 15)
Practical/Field work/Hands on learning: 70%, Credit – 1 (Lectures – 30)

THEORY

Unit I: Introduction to Pasta **(7 weeks)**

Description: This unit will include history of pasta , types of pasta, pasta making tools and equipment and understanding different sauces for preparing pasta dishes

Subtopics:

- History and types of pasta: packaged and handmade.
- Types: names and shapes of pasta.
- Tools and equipment commonly used for manufacturing pasta and preparing pasta dishes.
- Different types of sauces used for preparing pasta dishes: Tomato sauce, Béchamel, Bolognese, pesto and aglio olio.

Unit II: Introduction to Patisserie **(8 weeks)**

Description: This unit is about different types of Patisserie like short crust pastry, choux pastry, puff pastry, sponge cake, shortened travel cakes, cheese cakes, cookies, brownies and biscotti.

Subtopics:

- Short crust Pastry: Tarts and Pies
- Choux Pastry: Eclairs, Profiteroles.
- Puff Pastry: Patties, French Hearts, Vol au vents.
- Sponge cake and its decoration techniques.
- Shortened travel cakes and its variations.
- Cheesecakes with different toppings.
- Cookies, Brownies and Biscotti.

PRACTICALS

No. of Students per Practical Class Group: 10-15

1. Market survey of Packaged Pasta and patisserie. **(1 week)**
2. Orientation and handling of the tools and equipment used in Pasta making (mechanical pasta roller and cutter, rolling pins, serrated knives, ravioli cutters, drying rack and drying trays, stock pots, pans). **(1 week)**
3. Making the Pasta dough, shaping Pasta (Fettuccine, Farfalle, Macaroni, Noodles, Spaghetti, Vermicelli), drying and storage. **(2 weeks)**
4. Making Stuffed Pasta: Ravioli with fillings like spinach and Ricotta Cheese; herbed cream cheese. **(1 week)**

5. Making Sauces: Tomato, Bechamel, Pesto and preparing Pasta dishes with them. **(1 week)**
6. Making Baked Pasta: Mac n cheese and Lasagna. **(1 week)**
7. Preparation of short crust pastry: Tarts or Pies **(1 week)**
8. Preparation of Choux pastry: Eclairs or Profiteroles. **(1 week)**
9. Preparation of Puff pastry: Patties/ Vol au vents/ French Hearts **(2 weeks)**
10. Preparation of cakes (sponge cake/shortened cake) and their variations/decoration with whipped cream frosting. **(2 weeks)**
11. Preparation of Cheesecake with fruit compote topping. **(1 week)**
12. Preparations of Brownies or biscotti **(1 week)**

ESSENTIAL READINGS:

- Karr, N. (2016).Handmade Pasta Workshop & Cookbook: Recipes, Tips & Tricks for Making Pasta by Hand, with Perfectly Paired Sauces. US : Page Street Publishing .https://amzn.eu/d/6skTmuM(ISBN 10-1624143229, ISBN 13-978-1624143229)
- Donnelly,K. (2021). The Artisan Pasta Cookbook: The Step by Step Guide with Flavorful Recipes for Mastering Handmade Pasta, Noodles, Gnocchi and Risotto at Home.Oksana Alieksandrova. https://amzn.eu/d/dFir9Zx(ISBN 10-195460503X , 13-978-1954605039)
- Juillet, C. (1998). Classic Patisserie: An A-Z handbook. CBS publishers and distributors pvt .Ltd.https://amzn.eu/d/5RC7hja(ISBN 10-075063815X, ISBN 13-978-0750638159)
- Rippington, N. Baker, C. Burke, M (2013). Professional Patisserie: For Levels2 ,3 and Professional Chefs. Hodder Education; UK https://amzn.eu/d/352HVZy

  (ISBN-10: 1444196448, ISBN-13: 978-1444196443)

SUGGESTED READINGS:

- Dubey, S. C. (2016). Basic Baking - Science and Craft. Delhi: Society of Indian Bakers.
- Dubey, S. C. (2009). Bakery Vigyan. Delhi: Society of Indian Bakers
- Ketrapaul, N., Grewal, R.B., & Jood, S. (2005). Bakery Science and Cereal Technology. Delhi: Daya Publishing House.
- Edward, W. P. (2007). The Science of Bakery Products. Cambridge: RSC Publishing.

EXAMINATION SCHEME AND MODE:*(as per university guidelines)*

TotalMarks:100
Internal Assessment: 12 marks
End Semester University Theory Exam: 38 marks
Practical Exam: 50 marks

The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

FROZEN DESSERT TECHNOLOGY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite of the Course (ifany)
		Lecture	Tutorial	Practical/ Practice		
Frozen Dessert Technology	2	1	0	1	Class XII Pass	NIL

LEARNING OBJECTIVES:

This course will help learners be equipped with the skills of developing, packaging, innovating and marketing of frozen desserts like ice creams, sorbets, ice popsicles, yoghurts, traditional *kulfi*, etc. During the past decade, the frozen food industry has grown, with an array of innovations in ice-creams, frozen yogurt, gelato and traditional desserts such as *shrikhand*. There is vast scope for the development of lower-fat, reduced-sugar products which may lead to increased sales. This course will equip the students with knowledge and skills necessary to work in the frozen food industry.

The learning objectives of the course are:

- To learn basic concepts on processing, distribution and storage of frozen desserts
- To develop the skill of preparing various types of frozen desserts

LEARNING OUTCOMES:

- The students will be able to prepare/ process/pack/handle/sell different types of frozen desserts
- They will be equipped to work in frozen food industry or start own business – manufacturing, distribution and retail.

SKILL DEVELOPMENT AND JOB OPPORTUNITIES':

Employment Opportunities:

- Apprentice, supervisor, processor in frozen food manufacturing units/ distribution and retail outlets
- Entrepreneurship in frozen food industry
- Food Stylist / Designer for frozen desserts

SYLLABUS

Credits: 2 **Total lectures (45): 45 Hours/ 15 weeks**
Theory: 30%, Credit – 1 (Lectures – 15)
Practical/Field work/Hands on learning: 70%, Credit – 1 (Lectures – 30)

THEORY

Unit I: Food Freezing **(7 weeks)**

Description: This unit will give an introduction to the concept of frozen foods/industry, their properties. It will also include the various equipments, freezing systems/methods which can be used to process, store and maintain cold chain during distribution.

Subtopics:

- Background, description and properties of frozen foods
- Freezing time
- Equipment and Freezing systems (direct and indirect contact)
- Act, regulations and standards

Unit II: Frozen Desserts **(8 weeks)**

Description: This unit will focus on salient types of frozen desserts; both milk based as well as water based. It will include the composition, physical properties, processing, storage, freezing, common defects, packaging.

Subtopics:

Subtopics:

- Definitions and important terminology
- Ice-cream – composition, physical properties, processing, storage, freezing, common defects, packaging
- Ice based sherbets, sorbets, ice candies, popsicles
- Other frozen desserts – frozen yogurt, *shrikhnad*, mellorine, parevine, ice-cream sandwiches
- Future trends (novelties)

PRACTICALS

No. of Students per Practical Class Group: 10-15

1. Market survey of frozen desserts and accessories and basics of working in food lab. **(1 week)**
2. Preparation, packaging, labeling and sensory evaluation of vanilla ice cream **(2 weeks)**
3. Preparation, packaging, labeling and sensory evaluation of any fruit based ice cream (mango, strawberry, pineapple etc.) **(2 weeks)**
4. Preparation, packaging, labeling and sensory evaluation of Kulfi or nuts and fruit ice cream **(2 weeks)**
5. Preparation, packaging, labeling and sensory evaluation of ice cream with egg or gelato or frozen custard **(2 weeks)**
6. Preparation, packaging, labeling and sensory evaluation of ice cream sandwich or novelties **(2 weeks)**
7. Preparation, packaging, labeling and sensory evaluation of ice-lolly/ popsicles/ ice-candies **(2 weeks)**
8. Preparation, packaging, labeling and sensory evaluation of *Shrikhand* or frozen yogurt **(2 weeks)**

ESSENTIAL READINGS

- Raina, U., Kashyap, S., Narula,V., Thomas, S., Suvira, Vir, S., & Chopra, S. (2005). Basic Food Preparation – A Complete Manual. Delhi: OrientLongman.
- Khanna, K., Gupta, S., Seth, R., Mahana, R., & Rekhi, T. (2004). The Art and Science of Cooking. Delhi: Phoenix Publishing House Private Limited.
- Migoya, MJ. (2008). Frozen Desserts. First Edition. John Wiley and Sons Inc.
- Food Safety and Standards Authority of India (FSSAI). (2011). Food Safety and Standards (Food Products Standards and Food Additives) Regulations, 2011. Compendium on Food Additives Regulations. Elite Publishers. Pgs. 877.
- Food Safety and Standards Authority of India (FSSAI). (2019). FSSAI regulations on frozen desserts.
  Website: https://www.fssai.gov.in/upload/media/FSSAI_News_Ice_FNB_22_05_2019.pdf.

SUGGESTED READINGS:

- Clarke, C. (2004). The Science of Ice Cream. The Royal Society of Chemists.
- De, S. (2001). Outlines of Dairy Technology. First Edition. Oxford Publishing House.
- Francis, F.J. (2010). Encyclopedia of Food Science and Technology. Volume 2. Second Edition. John Wiley & Sons.
- Goff, H.D. & Hartel, R.W. (2008). Ice Cream. Seventh Edition. Springer.
- Himadari, P. (2010). Handbook on Frozen Food Processing and Freeze Drying Technology. First Edition. Engineers India Research Institute.
- Jana, A., Pinto, S. & Moorthy, P.R.S. (2016). Ice Cream and Frozen Desserts. AgriMoon.com Publishing. Website: https://www.agrimoon.com/wp-content/uploads/Ice-cream-Frozen-Dessrt.pdf.
- Rorer, S.T. (2005). Ice Creams, Water Ices, Frozen Puddings Together with Refreshments for All Social Affairs. First Edition. Project Gutenberg. Website: https://www.gutenberg.org/ebooks/8501.
- Stogo, M. (2018). Ice Cream and Frozen Desserts: A Commercial Guide to Production and Marketing. John Wiley & Sons.
- Tharp, B.W. & Young, L.S. (2012). Tharp and Young on Ice Cream: An Encyclopedic Guide to Ice Cream Science and Technology. First Edition. DEStech Publications Inc.
- Weinstein, B. (2010). The Ultimate Ice Cream Book. First Edition. Perfect Bound Publishing House. Website: https://www.pdfdrive.com/the-ultimate-ice-cream-book-over-500-ice-creams-sorbets-granitas-drinks-and-more-e184459836.html.

EXAMINATION SCHEME AND MODE:*(as per university guidelines)*

TotalMarks:100
Internal Assessment: 12 marks
End Semester University Theory Exam: 38 marks
Practical Exam: 50 marks
The Internal Assessment for the course may include Class participation, Assignments,

Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

INDIAN SNACK INDUSTRY

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution of the Course			Eligibility Criteria	Pre-requisite of the Course (if any)
		Lecture	Tutorial	Practical/ Practice		
Indian Snack Industry	2	1	0	1	Class XII Pass	NIL

LEARNING OBJECTIVES:

With changing lifestyles and rising income levels, the processed Indian Snack industry has grown exponentially in recent years due to a massive upsurge in the demand for snack (ready to eat/ ready to cook) products in India. This course will equip our students with knowledge and skills necessary to work in the snack industry, contribute to the growth and after gaining some experience start-up their own micro/macro enterprises.

The learning objectives of the course are:

- To provide students with the basic knowledge of Indian snack industry.
- To familiarize students with different types of Indian snacks.

LEARNING OUTCOMES:

- The students will be able to describe various aspects of Indian snacks industry and regional snacks.
- They will get familiarized with various types of snacks and their processing
- The students will attain practical skills to prepare traditional, regional and healthy snacks.

SKILL DEVELOPMENT AND JOB OPPORTUNITIES':

Employment Opportunities:

- Apprentice in Small Catering units/ Kiosk/ Restaurant
- Start-up of micro/macro enterprises
- Able to set up home based/ small scale food catering units
- Work in Cloud Kitchen
- Food Stylist / Designer

SYLLABUS

Credits: 2 **Total lectures (45): 45 Hours/ 15 weeks**
Theory: 30%, Credit – 1 (Lectures – 15)
Practical/ Field work/ Hands on learning: 70%, Credit – 1 (Lectures – 30)

THEORY

Unit I: Indian Snack Industry Current Scenario **(6 weeks)**

Description: This unit is an introductory unit about what is a snack food, the history and current trends of snacks industry and regional snacks of India.

Subtopics:

- Definition and history of snack foods in India.
- Current scenario of Indian snack industry.
- Indian regional snacks and their salient features.

Unit II: Processing of Snacks **(9 weeks)**

Description: This unit is about different types of Indian snacks and common packaging materials and techniques used in snack industry.

Subtopics:

- Packed Snacks of India: Classification of packaged snacks, common packaging materials and techniques
- Ready to cook (RTC) snacks, Instant snacks, Freshly prepared snacks, Extruded snacks.
- Usage of oils for frying and various seasonings
- Healthy snacks preparations (innovations in snack preparation)
- FSSAI License and regulations

PRACTICALS

No. of Students per Practical Class Group: 10-15

1. Weights, Measures and Food hygiene practices **(1 week)**
2. Basic cooking terminologies and techniques of preparation **(1 week)**
3. Pakoras/ fritters: Assorted pakoras, Bondas and its variations **(1 week)**
4. Cutlets and Tikkis – Mixed Veg cutlets,Sago cutlets, Aloo tikki, Vegetable tikki, **(1 week)**
5. Dough snacks: Kachori, Samosa, Spring rolls, Mathri, Kathi rolls, Pani puri **(2 week)**
6. Vadas: Dahi vada, Masala vadas, Medu vada and accompaniments **(1 week)**
7. Dips (Accompaniments): Mint chutney, Imli chutney, coconut chutney, Salsa sauce, Hummus, Hung curd dips, Guacamole etc. **(2 week)**
8. Marinates: Curd marinates, Green marinates, Pickled marinate etc. **(1 week)**
9. Tikkas and Kababs: Paneer tikka, Soya chaaps, Seekh kabab, Hara kabab **(1 week)**

10. Healthy snacks 1: Sprouts, Cheela, Roasted snacks, Bhel, Fruit chat **(1 week)**

11. Healthy Snacks 2: Fermented snacks (Idli (variations), Dhokla) **(1 week)**

12. Extruded snacks: Bhujia, Chakli, Fafda, Gathiya **(1 week)**

13. Packaging materials and techniques of packaging snacks **(1 week)**

ESSENTIAL READINGS:

- Raina, U., Kashyap, S., Narula,V., Thomas, S., Suvira, Vir, S., & Chopra, S. (2005). Basic Food Preparation – A Complete Manual. Delhi: OrientLongman.
- Khanna, K., Gupta, S., Seth, R., Mahana, R., &Rekhi, T. (2004). The Art and Science of Cooking. Delhi: Phoenix Publishing House PrivateLimited.

SUGGESTED READINGS:

- Kumar, B. (2021). Theory of Culinary Arts Delhi: RudraPublications
- Arora, K. (2011).Theory of Cooking. New Delhi Frank Bros &Co.
- Lusas E.W., Rooney, L.W. (2002). Snack Food Processing: Delhi, CRC Press LLC.

EXAMINATION SCHEME AND MODE:*(as per university guidelines)*

TotalMarks:100
Internal Assessment: 12 marks
End Semester University Theory Exam: 38 marks
Practical Exam: 50 marks
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

DAIRY PROCESSING

Credit Distribution, Eligibility and Pre-Requisites of The Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (If any)
		Lecture	Tutorial	Practical/ Practice		
Dairy Processing	2			2	XII (PCM/PCB)	

Learning Objectives

The Learning Objectives of this course are as follows:

- To study the processing of milk products

Learning outcomes

The Learning Outcomes of this course are as follows:

- The student will gain skills in dairy product development and hands-on training for the processing of different milk products.
- The student can establish a food industry/start up based on their learnings in the subject.
- The student can start provide 3rd party manufacturing to premiere dairy-based industries.
- After completing this SEC, the student can work in any dairy based industry.

Syllabus

Practical Exercises:

The learners are required to perform the following:

- Processing of Flavoured milk
- Preparation of Dahi
- Preparation of Ghee
- Preparation of milk based traditional Indian sweet
- Preparation of Ice cream
- Preparation of milk based instant mix
- Preparation of whey based drink
- Milk based new product development
- How to plan a startup, budgeting, marketing / case study/ entrepreneur (anyone of the above)
- Regulations, Licensing and registration of a startup

Essential/recommended readings

- De, Sukumar. (2007). Outlines of dairy technology. Oxford University Press.
- Webb B.H. & Alford (2005). Fundamentals of dairy chemistry. CBS Publisher
- P.F. Fox, T. Uniacke-Lowe and J.A.O' Mahony (2005). Dairy Science and Technology. Taylor & Francis.
- P. Walstra, Jan T.M. Wouters and Tom J. Geurts (2015). Dairy chemistry and Biochemistry. Springer

Note: Learners are advised to use the latest edition of readings.

Examination scheme and mode:

- TotalMarks:100
- Internal Assessment: 25 marks
- Practical Exam (Internal): 25marks
- End Semester University Exam:50marks
- The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

Skill progression

India is indisputably the largest milk producer in the world. Overall, dairy industry in India engages about 80 million households in rural area. The course 'Skills in Dairy Processing' provides valuable skills to the candidates required to be in a dairy industry. The course is planned to provide a hands-on training experience to the students in relevance to the dairy product preparation and setting up an enterprise. The other courses like Technology of Milk and milk products, Food Quality Management, Agri-business management, Sensory science, Food standards and regulations in the upcoming semesters will provide a deeper insight to the subject and will help students to improve their skill set.

FRUITS & VEGETABLE PROCESSING

Credit Distribution, Eligibility and Pre-Requisites of The Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (If any)
		Lecture	Tutorial	Practical/ Practice		
Fruits and Vegetable Processing	**2**			**2**	XII (PCM/PCB)	

Learning Objectives

1. To provide hands-on training to students for the entire process of selection, preparation, packaging, & presentation of variety of fruits & vegetable products.
2. To impart skills of scale-up production of fruits & vegetable products & by products for setting their own enterprise.

Learning Outcomes

1. This course will impart knowledge & skill of creating variety of value-added products of Consumer's choice & need.
2. The course will be suitable for enhancing the level of processing, level of value addition, share in global food trade & employability.

Syllabus

Unit I:

Practicals based on different processing/ preservation techniques.

1. Preparation of canned fruits /vegetables
2. Preparation of chips from potato/bittergourd/apples etc.
3. In bottle pasteurization of fruit juices, nectars, purees etc.
4. Preparation of fruit squashes
5. Preparation of fruit cordials
6. Preparation of fruit jams/jellies
7. Preparation of fruit nectars
8. Preparation of mango/chilli/ lime pickle
9. Preparation of Tomato puree & product
10. How to plan a startup, budgeting, marketing / case study/ entrepreneur (anyone of the above)
11. To study the Regulation, Licensing & registration of particular

Essential Readings

- Girdharilal., Siddappaa, G.S and Tandon, G.L.(2009). Preservation of fruits & vegetables. ICAR, New Delhi.
- Thompson, A.K., (2003). Fruits and vegetables; Harvesting, handling and storage. Blackwell Publishing.

Suggested Readings:

- Crusess, W.B. (2004). Commercial Unit and Vegetable Products. W.V. Special Indian Edition. Agrobios India.
- Manay, S. and Shadaksharaswami, M. (2004). Foods: Facts and Principles. New Age Publishers.
- Ranganna S.(2007). Handbook of analysis and quality control for fruits and vegetable products. Tata Mc Graw-Hill publishing company limited, Second edition.
- Srivastava, R.P. and Kumar, S. (2006). Fruits and Vegetables Preservation-Principles and Practices. 3rd Ed. International Book Distributing Co.
- Somogyi, L.P., Ramaswamy, H.S. and Hui, Y.H. (1996). Biology, Principles and Applications. Volume 1. Technomic Publishing Company, Inc.

Teaching Learning Process:

- Interactive Classes
- Experiential Learning
- Hands on training
- Standardization of product formulation
- Promote critical thinking to create new products
- Presentation of product report

Assessment Methods:

- Continuous evaluation of laboratory work and record file.
- Viva-voce, tests & graded assignments
- Presentation (Power point by students)
- Semester end University examination.

Key Words: Standardization, Dehydration, Pasteurization, TSS, Tomato puree, fruit jam, jelly, Nectars, Squash, Cordial, Homogenization, Packaging, Shelf-life, acceptability.

Skill Development and Job Opportunities: Justification

The food processing sector is one of the largest sectors in India in terms of production, growth, consumption, and export. however, there exists a definite lack in processing and storage infrastructure and skilled manpower, which are essential to reducing the waste and enhancing the value addition and shelf life of the farm products. The government has ambitious plans to increase the level of processing, value addition and share in global food trade. This will have a spike in the requirement for qualified and trained fruits & vegetable processing professionals. The main objective of having this paper is to impart knowledge of processing various value added fruits & vegetable products which is ultimately used to enhance the employability of any candidate studying the paper including food technology graduates.

CONFECTIONARY TECHNOLOGY

Credit Distribution, Eligibility and Pre-Requisites of The Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (If any)
		Lecture	Tutorial	Practical/ Practice		
Confectionary technology	2			2	XII (PCM/PCB)	

Learning Objectives

1. Understanding the status of confectionery industry in India
2. To learn the technologies of confectionery products
3. To know about innovations in this sector

Learning Outcomes

1. Understand the status of confectionary industry in India.
2. Attain knowledge of the standards & regulations, quality parameters for sugar, chocolates and other confectionery products.
3. Understand the technologies (equipment and process) for confectionary product preparations.

Syllabus

UNIT 1: Introduction (4 Hours)

Current status and economic importance of Confectionary Industry in India. Confectionery product types and there pertinent standards & regulations. Prepare a report on the same.

UNIT 2: Sugars (12 Hours)

- Sugars–Types and sources
- Explaining the methods of preparation of sugars, jaggery, khandsari, raw and refined sugar- quality and properties.
- Principles of sugar cookery, crystalline and non-crystalline candies.
- Estimation of Sugar solubility, acidity and sulphated ash content of sugar and jaggery
- Determine the effect of heat on sugar solution and perform the thread and cold-water test.
- To study the process of inversion, melting, caramelization and crystallization in sucrose.

UNIT 3: Confectionary Products (16 Hours)

- Confectionary Products: Cake icings, hard-boiled candies, toffees, fruit drops, chocolates and other confections- ingredients, equipment's & processes, product quality parameters, faults and corrective measures.
- To study the concept of sugar-based product formulation
  - Shakarpara
  - Chhena-murki
  - Fondant
  - Fudge
  - Brittles
  - Candy
  - Toffee
  - Fruit drop
  - Burfies

UNIT 4: Chocolate & its Products (12 Hours)

- chocolates and its products– ingredients, equipment's & processes, product quality parameters, faults and corrective measures.
- Cocoa butter, rendering and polymorphism of cocoa fat, properties of fat required for chocolate preparation
- To study the tempering of fat in chocolate preparation
- Cocoa butter replacers.
- To study the effect of cocoa butter replacer in chocolates

UNIT 5: Visit to confectionary plant to study equipment and processes (4 Hours)UNIT 6: Innovation with focus on health wellness products (12 Hours)

Compulsory Readings:

1. Beckette, S.T. (2009). Industrial Chocolate Manufacture. Blackwell Publishing Ltd.
2. Manay, S. & Shadaksharaswami, M. (2004). Foods: Facts and Principles. New Age Publishers.
3. Minifie, B.W. (1999). Chocolate, Cocoa and Confectionary. Aspen Publication.
4. Mohini, Sethi. & Eram, Rao. (2011). Food science- Experiments and applications, 2nd ed., CBS publishers &Distributors Pvt ltd.
5. Raina et.al. (2003). Basic Food Preparation-A complete Manual. 3rd Ed. Orient Longman Pvt. Ltd.

Suggestive Readings

1. Edwards, William. P. (2000). The Science of Sugar Confectionery, The Royal society of Chemistry
2. Geoff, Talbot. (2009). Science and Technology of Enrobed and Filled Chocolate, Confectionery and bakery products. CRC.
3. Lees, R. & Jackson, EB. (1992). Sugar Confectionery and Chocolate Manufacture. Springer

Teaching Learning Process

1. Class lectures
2. Power point presentations
3. Experimental learning through demonstrations
4. Industrial visit

Assessment Methods

1. As per University of Delhi norms
2. Assessment methods - quiz, identification tests, assignments
3. Feedback given to students for improving
4. Continuous evaluation of practicals

**Assessment tasks listed here are indicative and may vary.*

Keywords

1. Food Technology
2. Confectionary technology
3. Sugar products
4. Chocolate and cocoa

Skill Development and Job Opportunities

Trained confectioners are required to satisfy the taste buds of millions of consumers with products ranging from chikkies, burfies, luddoos and more sophisticated products like fudges, fondant icing, candies and delicate items like chocolates. Confectionery companies are expected to incorporate more nutritious add-ins like nuts, seeds and fruits to appeal to the health conscious demographic. There is an increased focus on innovation in this sector which is predicted to grow at minimum 8% annually. This syllabus will help in generation of employment in cities with a focus to transfer it to rural areas which are suppliers of raw material also. Moreover, this course will also help in self-employment of youth.

Food Waste and By-product Utilisation

Credit Distribution, Eligibility and Pre-Requisites of The Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (If any)
		Lecture	Tutorial	Practical/ Practice		
Food Waste and By-product Utilisation	**2**			**2**	XII (PCM/PCB)	

Learning Objectives

Environment sustainability is a key area of interest to government, scientist, environmentalist, researchers, and students. The present course is designed to address the issues of food waste and further their utilization into value added products. It's a multidisciplinary subject which can be taken by students of varied background. The objectives of the course are as follow:

- To improve students' understanding of basic food industry waste and by-product.
- To provide students an opportunity in understanding the significance of treating and utilizing food waste and by-products.
- To study effluent treatment plant.
- The practicals provide hands-on training in different type of food waste and by-products, further their utilization.
- After completion of course students can apply for courses specific to any category of food waste and further specialize in it.

Eligibility: Being interdisciplinary in its nature and scope, the course will be equally engaging and beneficial for students of all subject streams.

Learning Outcomes

- Identify waste produced from different sectors of the food industry.
- To provide hands-on training to students on utilization of waste from the food industry.
- Understand wastewater treatment.

Skill Development and Job Opportunities':

- Students are eligible to handle the processing and operations at effluent treatment plant running in food and chemical-based industries.
- Students can provide consultancy to waste industries.
- Students can also start with hands-on training to students and industrialist on handling and utilizing the waste from industries.
- Students can work with Ministry of Agriculture to devise ways of utilizing the food

waste.

- Students can start his/her own start-up by providing waste water treatment services to food industries.
- The course will provide basic training enabling students to apply to advanced food waste management courses.

Syllabus Credits: 2

1. Identification of waste from agriculture and food processing (Dairy/ Meat/ Fruits Vegetables / Alcoholic beverages/ cereals)
2. Study and layout of waste water treatment system (ETP)
3. Identification of co-products from F&V industry, estimation and utilization to develop value added products (pectin, banana fibre, lycopene from tomato waste, watermelon/ pumpkin rind).
4. Identification of waste from animal industry and utilisation to develop value added products (gelatin, egg shell).
5. Identification of various co-products from dairy industry, estimation and utilization to develop value added products (utilisation of ghee residue, buttermilk beverage, whey).
6. Identification of co-products from cereal industry, estimation and utilization to develop value added products (cereal husk, wheat fibre).
7. Determination of physico-chemical properties of wastewater.
8. Production of alcohol/ acetic acid from waste material.

Essential reading

- Marriott, N. G., Gravani, R. B., & Schilling, M. W. (2006). Principles of food sanitation (Vol. 22). New York: Springer.
- Sadasivam, A, & Manickam, A. (2021). Biochemical Methods. New Age International Publishers.
- Green, J. H., & Kramer, A. (1979). Food Processing. Waste Management. Avi Publishing Company, 629.
- Herzka, A. and Booth, R.G. Food Industry and Trade: Recycling Waste. Applied Science Publishers, 1981.
- Tegge, G., Green, J. H., and A. Kramer. Food Processing Waste Management; AVI Publishing, 1979

Examination scheme and mode:

- Total Marks:100
- Internal Assessment: 25 marks
- Practical Exam (Internal): 25 marks
- End Semester University Exam: 50marks
- The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty

Paper and Skill Progression

The paper provides understanding a huge untapped sector if food wastage. This waste across globe is an environment concern. Students will be able to deeper understanding to the huge market of food wastage from industries. The course is designed to provide exclusive hands on training to students so that they can contribute the same to industries in search of food waste management.

Justification

The paper is multidisciplinary and thus relevant to students from varied field . The paper provide skills which are relevant to students from job point of view . After doing the course student can take up job easily in food waste management. Student will be capable of working in effluent treatment plants as well as establishing waste utilisation department in industry.

MINIMAL PROCESSING OF FOOD

Credit Distribution, Eligibility and Pre-Requisites of The Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (If any)
		Lecture	Tutorial	Practical/ Practice		
Minimal Food Processing	**2**			**2**	XII (PCM/PCB)	

Learning Objectives

1. The changing Socio economic situations, work ethics and Demographics of our Country, specially in the Urban and Semi urban areas, have led to a change in eating habits and food consumption patterns. There is a definite shift towards healthy and ready to eat foods. Minimal Processing of foods provides the best combination of health, nutrition and convenience
2. The course aims to impart skills in food processing for extending the shelf life with minimal processing that results in minimum changes to sensory characteristics and nutritional qualities, yet imparting convenience to the consumer.
3. The course aims to make students aware of the Various Novel technologies being developed and used for Minimal processing across the world.

Course Outcomes

1. Enable the students to have skills and knowledge of methods of preservation by minimal processing of food.
2. To provide hands-on training to students for the minimal processing of different food samples

Syllabus

THEORY **Total Lecture (Nos): 15 Hours**

Unit 1: Basic minimal processing (8 Hours)

Introduction and importance of minimal processing, Preparation and pre-treatments, Minimal processing of foods by thermal, refrigeration and freezing methods, MAP (Modified Atmosphere Packaging) and CAP (Controlled Atmosphere Packaging). Physiological responses and biochemical changes during minimal processing of fruits and vegetables, Meat, Fish, poultry and Dairy products. Role of minimal processing in economic creation.

Unit 2: Advanced technologies in minimal processing of foods (7 Hours)

Principle and applications of; irradiation, pulsed electric field processing, high pressure processing, pulsed light, ultrasound, ohmic heating, sous vide.

PRACTICALS (30 Hours)

1. To study basic hygiene and sanitation requirements for minimal processing
2. Preparation and pre-treatment method for minimal processing of fruits and vegetables.

3. Minimal processing of Meat products.
4. Minimal Processing of fish and Poultry.
5. Minimal processing by Vacuum/ MAP/CAP/ edible coating.
6. Minimal Processing of Dairy Products.
7. To study the shelf life and quality characteristics of minimally processed foods available in the market
8. To study the effect of packaging material on shelf life of different minimally processed foods.
9. To determine the cost of minimally processed food.

Compulsory Readings:

- Fellows, P. J. (2009). Food processing technology: principles and practice. Elsevier Rahman, M. S. (Ed.). (2007). *Handbook of food preservation*. CRC press.
- Tewari, G., & Juneja, V. (Eds.). (2008). *Advances in thermal and non-thermal food preservation*. John Wiley & Sons.

Suggestive Readings:

- Barbosa-Canovas, G. V., Tapia, M. S., & Cano, M. P. (Eds.). (2004). *Novel food processing technologies*. CRC press.
- Bansal, V., Siddiqui, M. W., & Rahman, M. S. (2015). Minimally processed foods: overview. *Minimally processed foods*, 1-15.

Teaching Learning Process

- Power point presentation
- Experiential learning through demonstration

Assessment Methods

- As per University of Delhi norms
- Quiz/ test, assignment, presentation
- Continuous evaluation of practicals
- End semester exam

Keywords:

Nutritional quality, Peeling, Non-thermal methods, Packaging, Advance processing

Job/Employment Opportunities:

- Students can establish his/her start-up specialized in minimal food processing of foods.
- Students can help in Research and Development in food industries to explore various novel technologies for minimal processing.
- Students can either collaborate or join with any Food Industry and help in

developing various thermal and non-thermal techniques in food processing.

WORKING WITH PEOPLE

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
WORKING WITH PEOPLE	2	1	0	1	Class XII from any discipline as per University guidelines	NIL

Learning Objectives

The Learning Objectives of this course are as follows:

- To inculcate values in strengthening knowledge and skills in field work practice learning
- To develop aptitude and attitude to work in the field
- To enhance skills of self-awareness, self-development, goal setting and time management

Learning outcomes

At the end of the semester the students will be able to

- Develop a practical understanding of using different skills while working with individuals and groups
- Develop skills and competencies to work effectively in field settings
- Acquire understanding about self, goal setting, networking, and communication

SYLLABUS

Course Content

Unit I: Developing Personal and Professional Self **Unit Description:** This unit will provide a conceptual understanding of Self-awareness and sensitivity. The students will learn about goal setting, time management and ethics in social work practice.	**(No. of lectures)** **7** **Weeks: I-IV**
Subtopics: ● Understanding personal self and professional self. ● Professional Ethics: Responsibility, accountability, loyalty, commitment, cultural sensitivity and competence. ● Goal setting and time management	
Unit II: Planning for Field Work Practice **Unit Description:** This unit will introduce the students to strategic learning plans required for field work, thematic modules for different target groups and importance of rapport building and communication while working in community.	**(No. of lectures)** **8** **Weeks: V-VIII**
Subtopics: ● Preparation of Field work learning plans and strategies. ● Rapport building, initiating dialogues and sustaining communication. ● Thematic learning modules for targeted populations: Children, adolescent, youth and elderly.	
Unit III: Documentation in Field Work **Unit Description:** This unit will focus on documentation and maintaining records while working with individuals, groups and communities. The students will also learn to develop community profile.	**(No. of lectures)** **7** **Weeks: IX-XI**
Subtopics: ● Case records ● Group work records ● Community profile	
Unit IV: Application of Skills and Techniques **Unit Description:** This unit will introduce various skills and techniques required in understanding self and mobilising support.	**(No. of lectures)** **8** **Weeks: XII-XV**
Subtopics: ● Understanding Self: Johari Window ● Strength and Weakness- SWOT Analysis ● Mobilising Community Support: Networking, Advocacy and Public Relation	

Practical component (if any) – Unit III & IV application based

Essential readings

- Datar,S. et al. (2010). Skill Training for Social Workers: A Manual. New Delhi: Sage Publications
- Kumar, S. (2002).Methods for Community Participation: A Complete Guide for Practitioners. London: ITDG Publishing.
- Nair,R., Juvya,S., & Nadkarni,V. (2020). Field Instructions in Social Work Education, The Indian Experience. Routledge India.

- Subhedar, I. S. (2001). Field Work Training in Social Work. New Delhi: Rawat Publications.
- Trevithik, P. (2000). Social Work Skills: A Practice Handbook. Buckingham, Philadelphia: Open University Press.
- Verma, R.B.S. & Singh, A.P. (2013).Standard Manual for Field Work Practicum in Social Work. Lucknow: New Royal Book Company.

Suggested readings

- NAPSWI. (2016). NAPSWI's Code of Ethics for Professional Social Workers in India. New Delhi: National Association of Professional Social Workers in India

ASSESSMENT

Internal Assessment: 50 Marks

The students are required to prepare project work/assignments/case studies/ presentations/reports. The social work students will fulfil requirements of project work etc based on 2 hours spent weekly in field work in a social welfare organisation and/or skill labs. The student from course other than social work will fulfil requirement of project work etc through workshops/skill labs/guided field visits. It is compulsory to maintain at least 80% attendance for field work based project work.

Semester End Examination: 50 Marks as per University academic calender

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

LIFE SKILL EDUCATION

Credit distribution, Eligibility and Prerequisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
LIFE SKILL EDUCATION	2	1	0	1	Class XII from any discipline	NIL

Learning Objectives

The Learning Objectives of this course are as follows:

- To impart life skills education in field work practice
- To strengthen life skills for career building, critical thinking, attitudinal base for innovate leadership
- To learn the application of life skills in diverse field work settings

Learning outcomes

At the end of the semester the students will be able to

- Focus on development of values in strengthening knowledge and life skills, bringing high quality standards in field work practice-learning
- Understand the strength-based life skill development, team work, innovate leadership, design thinking and career building skills
- Develop universal human values while utilizing life skills in field work

SYLLABUS

Unit I: Life Skills Introduction **Unit Description**: To introduce students to the basic concepts of life skill management.	**(No. of lectures)** **7** **Weeks: I-IV**
Subtopics: ● Basic Life Skills: Concept, Components and Significance ● Life Skills Development: National Perspective ● Universal Human Values – Love, Compassion, Truth, Non-violence, Peace, Gratitude, Patience and Tolerance	
Unit II: Basic Life Skills **Unit Description**: To learn the set of essential life skills that can lead to high employability and good work culture.	**(No. of lectures)** **8** **Weeks: V-VIII**
Subtopics: ● Team Work Skills: Social Etiquettes, Democratic Decision, and Collaboration ● Innovative Leadership: Initiative taking, Time Management, Capacity building, Life Coaching ● Career Building Skills: Exploring Career Opportunities, Mentoring, Resume Preparation, facing Interview & Group Discussion,	

Presentation Skills, Creating social media profile	
Unit III: Significant Life skills and Techniques **Unit Description**: To understand potential changes that can be brought about by employing essential life skills	**(No. of lectures)** **7** **Weeks: IX-XI**
Subtopics: ● Developing Strategies for enhancing Life Skills ● Life Skills (Cognitive based): Critical Thinking, Knowledge construction, Evaluating reasoning, Solution Focused Thinking, ● Life Skills (Behavioural Based): Ethics, Integrity, Problem Solving, Decision making	
Unit IV: Application of life skills in Field Work **Unit Description**: To learn the application of essential life skills in diverse settings through case studies about interventions	**(No. of lectures)** **8** **Weeks: XII-XV**
Subtopics: Developing specific life skills intervention plan for ● Stress Management and Coping strategies ● Simulation exercises: Brainstorming, Role plays for Team building ● Case Management	

Practical component (if any) – Unit III & IV application based

Essential readings

- Bandyopadhyay and Subrahmanian (2008), Gender Equity in Education: A Review of Trends and Factors
- Brinkman, F. J. (2016). Environment, Religion and Culture in the Context of the 2030 Agenda for Sustainable Development, (April).
- Brown, T. (2012). Change by Design. Harper Business
- Care, E., Kim, H., Anderson, K., & Gustafsson-Wright, E. (2017). Skills for a Changing World: National
- Census of India. (2011), Registrar General of India
- Clarke, D., Bundy, D., Lee, S., Maier, C., Mckee, N., Becker, A., Paris, F. (n.d.). Skills for Health Skills-based health education including life skills: An important component of a Child-Friendly/Health-

- Dewan S, Sarkar U (2017) From education to employability: Preparing South Asian Youth for the world of work, UNICEF ROSA
- International Youth Foundation. (2014). Strengthening life skills for youth : A practical guide to quality programming.
- Kwauk C & Braga. (2017) Life skills education is more than teaching skills, Brookings institution Washington DC
- LIFESKILLS EDUCATION. (n.d.). Retrieved from, http://www.cbse.nic. in/cce/life_skills_cce.pdf
- Perspectives and the Global Movement. Retrieved from https://www.brookings.edu/wp-content/uploads/2017/03/global-20170324-skills-for-a-changing-world.pdf

Suggested readings

- Martin, R. (2007). How Successful Leaders Think. Harvard Business Review, 85(6): 60.
- Govt. of India. (2014 & 2016) Educational Statistics at a glance, MHRD,
- Murphy-Graham (2012), Opening Minds, Improving Lives: Education and Women's Empowerment in Honduras
- Sen Madhucchanda (2010), An Introduction to Critical Thinking, Pearson, Delhi
- South, T., Life, A., & Forum, E. (2005). Life Skills-Based Education in South Asia.
- Street, C. (2012). Global Life Skills Education Evaluation, (February).
- WHO (1997). Life Skills Education for Children and Adolescents in Schools. Geneva: WHO.

Internal Assessment: 50 Marks

The students are required to prepare project work/assignments/case studies/ presentations/reports. The social work students will fulfil requirements of project work etc based on 2 hours spent weekly in field work in a social welfare organisation and/or skill labs. The student from course other than social work will fulfil requirement of project work etc through workshops/skill labs/guided field visits. It is compulsory to maintain at least 80% attendance for field work based project work.

Semester End Examination: 50 Marks as per University academic calender

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

PARTICIPATORY LEARNING AND ACTION

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
PARTICIPATORY LEARNING AND ACTION	**2**	**1**	**0**	**1**		**NIL**

Learning Objectives

The Learning Objectives of this course are as follows:

- To understand the basic principles and process of using Participatory Learning in field work settings
- To learn various techniques of Participatory Learning for working in rural and urban communities
- To learn the skills involved in application of participatory learning techniques

Learning outcomes

At the end of the semester the students will be able to

- Identify the situations where participatory learning techniques can be applied
- Demonstrate the process of various techniques and skills of participatory learning in field setting
- Analyse PLA data and reflect the same in report writing

SYLLABUS OF SEC-3

Course Content

Unit I: Introduction to Participatory Learning and Action **Unit Description**: This unit introduces the students to the concept of Participatory Learning and Action (PLA). The students will also learn the advantages of PLA and its use over other similar techniques.	**(No. of lectures)** **7** **Weeks: I-IV**
Subtopics: ● Participatory learning Action (PLA): Meaning, origin and principles ● Participatory learning: Basic rules and phases ● Preparations for PLA	
Unit II: PLA : Tools and Techniques **Unit description:** This unit aims to familiarize students with various tools and techniques of PLA which can be applied in community setting.	**(No. of lectures)** **8** **Weeks: V-VIII**
Subtopics: ● PLA techniques I: Community mapping (social & resource mapping), ● PLA Techniques II: livelihood analysis, Venn(chapati) diagram, Time line analysis, Vector scoring, (preference ranking, issue prioritization, wealth ranking), Calendars (Seasonal calendar, Daily routine diagram), Transect walk ● Roles and responsibilities of PLA teams	
Unit III: Practical Application of Participatory Learning techniques **Unit Description:** The students will be engaged in hands on learning for practical application of PLA techniques through workshops and group exercises.	**(No. of lectures)** **7** **Weeks: IX-XI**
Subtopics: ● Project work: Community Mapping, ● Project work: Need assessment (Calender/Seasonal Analysis/Transect Walk/Vector scoring) ● Project work: Resource identification & Utilization	
Unit IV: Analysis of data through PLA Techniques **Unit description:** The students will learn to analyse the information collected through PLA tools.	**(No. of lectures)** **8** **Weeks: XII-XV**
Subtopics: ● Use of PLA for research and community action ● Processing, analysis and interpretation of data generated through participatory learning tools ● Report writing: Tips and techniques	

Practical component (if any) – Unit III & IV application based

Essential readings

- Chambers, R (1983) Rural Development: Putting the last first. Longman inc., USA, 1983.

- Chambers, R (2008). Revolutions in Development Inquiry. Institute of Development Studies, 2008, Earthscan, London.
- Mikkelsen, B (1995). Methods for Development Work and Research: A guide for practitioners. London, Sage.
- N. Narayansamy (2009): Participatory Rural Appraisal-Principles, Methods and Application, first edition. Gandhigram Rural University, Tamil Nadu, India
- Ramesh, R (2020):Participatory Rural Appraisal :PRA Application in Rural Development Planning. National Institute of Rural Development and Panchayati Raj Ministry of Rural Development, Government of India.
- Slocum, R; Wichhart, D; Rocheleau, D and Thomas-Slayter, B (eds.) (1995). Power, Process and Participation – Tools for change. London, IT Publications

Suggested readings

- Jules N. Pretty, Irene Guijt, Ian Scoones, & John Thompson (1995): A Trainer's Guide for Participatory learning and Action. International Institute for Environment and Development, London.
- Gosling, L and Edwards, M (2003). Toolkits: A practical guide to assessment, monitoring, review and evaluation. Second edition. Save the Children, UK
- The Leprosy Mission Trust India TLMTI (2015): Participatory Learning Approach Training Manual, New Delhi.
- Mukherjee, N. (1993): Participatory rural appraisal: Methodology and applications (Studies in rural participation). Concept publications,India.
- Mascarenhas, J (1991): Participatory Rural Appraisal and Participatory Learning methods: recent experiences from Myrada and South India, RRA Notes, Issue 13, pp.26–32, IIED, London.

ASSESSMENT

Internal Assessment: 50 Marks

The students are required to prepare project work/assignments/case studies/ presentations/reports. The social work students will fulfil requirements of project work etc based on 2 hours spent weekly in field work in a social welfare organisation and/or skill labs. The student from course other than social work will fulfil requirement of project work etc through workshops/skill labs/guided field visits. It is compulsory to maintain at least 80% attendance for field work based project work.

Semester End Examination: 50 Marks as per University academic calender

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

PROGRAMME MEDIA

Credit distribution, Eligibility and Prerequisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
PROGRAMME MEDIA	**2**	**1**	**0**	**1**		**NIL**

Learning Objectives

The Learning Objectives of this course are as follows:

- To understand the concept of programme media and its importance in field work practice
- To learn about various types of programme media and their effective use in field work
- To learn to demonstrate creative ideas and tools in field settings

Learning outcomes

At the end of the semester the students will be able to

- Learn the concept of programme media in social work
- Develop various programme media tools to be used in field settings
- Demonstrate the skills essential for using programme media in the field work

SYLLABUS

Unit I: Understanding Programme Media **Unit Description:** This unit will give an opportunity to the students to understand the concept of programme media in social work.	**(No. of lectures)** **7** **Weeks: I-IV**
Subtopics: • Programme media: Concept, characteristics, purpose and significance • Communication in programme media • Role of programme media: propaganda and public opinion	
Unit II: Mediums and Methods of Programme Media **Unit Description:** Student will learn different types of programme media to be used for diagnostic, problem-solving and therapeutic purposes.	**(No. of lectures)** **8** **Weeks: V-VIII**

Subtopics: • Types of programme media: Talk, public meeting & hearing, group discussion, press conference, movement, advertisement, campaign, storytelling and entertainment/games • Information and digital literacy: Concept, importance and components • People's participation in programme: Film screening, discussion and review	
Unit III: Handmade Creations and Creative Writings in Social Work **Unit Description:** This unit will give an opportunity to the students to learn various handmade creations and creative writings of programme media to interact with client groups.	**(No. of lectures)** **7** **Weeks: IX-XI**
Subtopics: • Handmade creations: Collage, poster making, wall paintings • Creative writings: short story writing, slogans writing and preparing brochures, hand-outs & pamphlets, FAQs • IEC materials: Flip chart, flash cards, flyers, leaflets, banners, hoardings and standee	
Unit IV: Programme Media for Masses **Unit Description:** The students will be engaged in various learning activities related to application of programme media in field settings.	**(No. of lectures)** **8** **Weeks: XII-XV**
Subtopics: • Tools preparation: Puppet shows & folk songs, • Performing arts: street plays, drama & theatre &, mime, skit and role plays • Significance of digital media: TV, community radio broadcast and various social media platforms	

Practical component (if any) – Unit III & IV application based

Essential readings

- Balwant, G. (1991). Folk Theatre in India. Bombay: Rupa & Co.
- Chen, H. T. (2005). Practical Programme Evaluation: Assessing and Improving Planning, Implementation and Effectiveness. California: Sage Publication.
- Cortright, R. & Hinds, G. (1959). Creative Discussion. New York: The Macmillian Company.
- Dev, M. P. (2009). Creative Writing: A Beginner's Manual. New Delhi: Pearson Longman.

- Mathur, D. (2003). AASHAA, Short Stories by Indian Women, Odyssey II. London: Indian Bookshelf and New Delhi: Star Publishing.
- Menon, M. & Gandhi, V.P. (1997.) Media and Communications - Vol. I. (New Information Order). New Delhi: Kanishka Publishers/Distributors.

Suggested readings

- National School of Drama. (2006). Nukkad Natak Rachnaaur Prastuti. Delhi: NSD.
- Mohan, K. &Banerji, M. (1990). Developing Communication Skills. Pilani: Birla Institute of Technology and Science.

ASSESSMENT

Internal Assessment: 50 Marks

The students are required to prepare project work/assignments/case studies/ presentations/reports. The social work students will fulfil requirements of project work etc based on 2 hours spent weekly in field work in a social welfare organisation and/or skill labs. The student from course other than social work will fulfil requirement of project work etc through workshops/skill labs/guided field visits. It is compulsory to maintain at least 80% attendance for field work based project work.

Semester End Examination: 50 Marks as per University academic calender

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

ENVIRONMENTAL IMPACT AND RISK ASSESSMENT

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
ENVIRONMENTAL IMPACT AND RISK ASSESSMENT	02	0	0	02	12th Science	None

Learning Objectives

- Gain insights into the concepts of environmental impact assessment and its relevance for sustainable development
- Acquire knowledge of the socio-ecological and economic perspectives of any developmental project.
- Evaluate methodologies to conduct and analyze EIA acceptable per prevalent regulations

Learning outcomes

The Learning Outcomes of this course are as follows.

After the course, the students will be able to

- Conduct EIA of any developmental project and analyze its environmental and other implications
- Serve as consultant to different agencies working on EIA and a developmental plan
- Evolve strategies to ensure development and conservation hand-in-hand
- Formulate sustainable development strategies for any development plan varying in scale
- Identify and classify different development projects based on their sales and impacts on the environment

SYLLABUS: ENVIRONMENTAL IMPACT AND RISK ASSESSMENT

Practicals/Hands-on Exercises (02 Credits: 60 hours)

1. Based on the given project details, classify them as Category A and Category B1 and B2 projects.
2. Prepare the scope of any recent developmental project of Category A which received Environmental Clearance.
3. To prepare a questionnaire and compilation of primary data to study the scope of the project based on public participation.
4. Identify the impacts due to a Mining Project using the checklist method.
5. Based on the impacts identified in Activity 4, formulate mitigating measures for the project.
6. Determine the impacts due to a large-scale hydropower project in a given state using the matrix method and geo-spatial data,
7. Prepare an environmental management plan for a mining project.
8. To conduct a public hearing for any project and prepare a draft for the process.
9. Prepare a brief life cycle assessment of a smartphone.
10. Prepare a brief EIA report of a River Valley Project.

Teaching learning interface for practical skills

To impart training on technical and analytical skills related to the course objectives, a wide range of learning methods will be used, including (a) laboratory practicals; (b) field-work exercises; (c) customized exercises based on available data; (d) survey analyses; and (e) developing case studies; (f) demonstration and critical analyses; and (h) experiential learning individually and collectively.

Prospective Sectors:

As per the Ministry of Environment, Forests, & Climate Change (MoEF&CC), Govt. of India, ~30 sectors require EIA for Environmental Clearance before any project activity. Some of them include Mining, Oil and gas exploration, development & production, River valley, hydel, drainage and irrigation projects, thermal Power plants, Nuclear power projects, Coal washeries, Mineral, Metallurgical industries, Cement plants, Petroleum industry, Coke oven plants, Asbestos milling, Chlor-alkali industry, Soda ash Industry, Chemical fertilizers, Pesticides industry, Synthetic organic chemicals industry, Distilleries, Integrated paint industry, Pulp & paper industry, Induction/arc furnaces, Air ports, All ship breaking yards, Industrial estates, Common hazardous waste treatment, storage and disposal facilities, Highways, railways, transport terminals, mass rapid transport systems, Building and large construction projects, Townships, and area development projects.

Essential/recommended readings

- EIA 2020. Ministry of Environment, Forest and Climate Change, Draft Environment Impact Assessment Notification, 2020, <http://environmentclearance.nic.in/writereaddata/om/6998FGGHOI_Gaztte_EIA2020_Comments.pdf>.
- Glasson, J. and Therivel, R., 2013. Introduction to Environmental Impact Assessment. Routledge.
- MacKinnon, A.J., Duinker, P.N. and Walker, T.R., 2018. The Application of Science in Environmental Impact Assessment. Routledge.
- Mareddy, A.R. (2017) Environmental Impact Assessment Theory and Practices, Butterworth Heinemann.

Suggested readings

- Judith, P. 1999. Handbook of Environmental Impact Assessment. Blackwell Science.

- Lawrence, D.P., 2013. Impact assessment: practical solutions to recurrent problems and contemporary challenges. John Wiley & Sons.
- Marriott, B. 1997. Environmental Impact Assessment: A Practical Guide. McGraw-Hill, New York, USA.
- Petts, J. (1999). Handbook of Environmental Impact Assessment. Vol. 1, Blackwell Science.

SUSTAINABILITY REPORTING

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
SUSTAINABILITY REPORTING	02	0	0	02	12th Pass	None

Learning Objectives

- Gain insights into the step-by-step process of writing a sustainability report using internationally acceptable standards.
- Evolve a holistic view of sustainability and understand the carrying capacity of ecosystems for human needs.
- Acquire skills to address sustainability challenges in a global context.
- Evaluate industrial/organizational processes/programmes based on the interconnections among economic, environmental, and social activities

Learning outcomes

The Learning Outcomes of this course are as follows.

After the course, the students will be able to

- Develop a multi-disciplinary and holistic perspective of sustainability and identify key factors determining sustainability and associated benefits
- Write sustainability reports using universal, sector, and topic standards
- Explain sustainability challenges and effective methods to communicate it to different stakeholders
- Apply sustainability concepts, and GRI Standards for sustainable industries
- Serve as environmental consultants to different industries
- Advise governments on sustainable environmental polices

SYLLABUS: SUSTAINABILITY REPORTING

Practicals/Hands-on Exercises (02 Credits: 60 hours)

1. Investigate the framework for sustainability reporting outlined by global reporting initiatives (GRI)
2. Analyse universal, sector, and topic standards given by GRI
3. Develop sustainability reporting of your institute
4. Examine and report the sustainability of your residential society or residential area around your College
5. Compare and contrast sustainability reporting of the market in your neighbourhood and the selected mining industry
6. Visit a thermal power plant in and around your city and write its sustainability report
7. Using appropriate standards, evaluate the sustainability of a Cement Factory in your city
8. Field survey of a waste treatment facility in your city, assess their sustainability and give recommendations if required.
9. Analyze the potential and limitations of certified tools and software recommended by the GRI for sustainability reporting
10. Examine and evaluate sustainability reports available on different sectors and topics worldwide and give appropriate recommendations, if any.

Teaching learning interface for practical skills

To impart training on technical and analytical skills related to the course objectives, a wide range of learning methods will be used, including (a) laboratory practicals; (b) field-work exercises; (c) customized exercises based on available data; (d) survey analyses; and (e) developing case studies; (f) demonstration and critical analyses; and (h) experiential learning individually and collectively.

Prospective Sectors:

All Multi-National Companies, (b) Environmental and Sustainability Consultancies, (c) Environmental NGOs, (d) World Bank, and (e) UNDP

Essential/recommended readings

- Bini, L. and Bellucci, M., 2020. Integrated Sustainability Reporting: Linking Environmental and Social Information to Value Creation Processes. Springer.
- A Short-Introduction to GRI Standards. https://www.globalreporting.org/media/wtaf14tw/a-short-introduction-to-the-gri-standards.pdf
- Evaluating National Policies on Corporate Sustainability Reporting https://wedocs.unep.org/handle/20.500.11822/9435
- Gutterman, A.S., 2021. Sustainability Reporting and Communications. Business Expert Press.
- Sustainability Reporting in the Financial Sector: A Governmental Approach https://wedocs.unep.org/handle/20.500.11822/17375
- United Nations Environment Program (UNEP), 2015. Raising the bar: Advancing environmental disclosure in sustainability reporting.

Suggested readings

- Greiling, D., Traxler, A.A. and Stötzer, S., 2015. Sustainability reporting in the Austrian, German and Swiss public sector. International Journal of Public Sector Management.
- https://www.globalreporting.org/reporting-support/reporting-tools/certified-software-and-tools/

ENVIRONMENTAL AUDITING

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
ENVIRONMENTAL AUDITING	02	0	0	02	12th Pass	None

Learning Objectives

- Gain an understanding of the fundamental principles and components of environmental auditing
- Train in conducting an environmental audit in any organization/ institution
- Implement critical thinking toward environmental problems and formulate local solutions for their mitigation

Learning outcomes

The Learning Outcomes of this course are as follows.

After the course, the students will be able to

- Conduct an environmental audit in a scientific manner
- Recommend organizations to adopt specific sustainable strategies
- Serve as catalyst to evolve sense of ownership and responsibility among organizations/industries towards solving local environmental problems.
- Pursue environmental auditing for higher studies and a future career.

SYLLABUS: ENVIRONMENTAL AUDITING

Practicals/Hands-on Exercises (02 Credits: 60 hours)

1. Prepare a working plan (in the form of a flowchart/ graphical abstract) for the environmental audit of any organization/ institution focusing on pre-audit, on-site and post-audit objectives and activities
2. Prepare a brief profile of any selected organization/ institution (Area, land use, green cover, organizational setup, demography etc.) and discuss its environmental policy and the environmental management systems
3. Prepare an interpretive electricity consumption report of the organization/ institution over a five-year period (both actual or arbitrary data can be used).
4. Prepare an interpretive water consumption report of the organization/ institution over a five-year period (both actual or arbitrary data can be used). Also, identify the sources of wastewater discharge and its management, if any.
5. Survey the campus and prepare a list of the plant/ animal (or both) diversity, highlighting its importance and threats faced.
6. Prepare a monthly air quality level dataset nearest to the institution's location, extracting data from the National Air Quality Index (CPCB) website. Prepare a report on causes of variation and measures taken by an organization to improve air quality levels
7. Prepare a comprehensive assessment report of Solid Waste Management at the organization/ institution highlighting compliance to Solid Waste Management Rules, 2016.
8. Formulate a scientifically sound protocol for identifying and disposing of e-waste and hazardous waste at any organization based on E-waste (management) rules, 2016 and Hazardous waste (management) rules, 2016.
9. Examine various environment-related practices and activities of the organization/ institution that have impacted the neighbouring communities and prepare a social audit questionnaire for studying the impact.
10. Compile the data, results, and analysis of all previous practicals and prepare a detailed environmental audit report of your selected organization/ institution.

Teaching learning interface for practical skills

To impart training on technical and analytical skills related to the course objectives, a wide range of learning methods will be used, including (a) laboratory practicals; (b) field-work exercises; (c) customized exercises based on available data; (d) survey analyses; and (e) developing case studies; (f) demonstration and critical analyses; and (h) experiential learning individually and collectively.

Prospective Sectors:

(a) Universities/Colleges, (b) Environmental Consultancies, (c) Environmental NGOs, and (d) Indian Audit & Revenue Departments

Essential/recommended readings

- Cahill, L.B (2017). Environmental Health and Safety Audits: A Compendium of Thoughts and Trends, 2nd Edition, Bernan Press.
- Council, N.C., Britain, G. and Unit, E.F., 2011. Handbook for Phase 1 Habitat Survey: A Technique for Environmental Audit. Nature Conservancy Council.
- Ho G, Anda, M., Brennan, J., 2015. Water Auditing and Water Conservation. IWA Publishing
- Pain, S.W., 2010. Safety, Health, and Environmental Auditing: A Practical Guide. CRC Press.
- Thuman, A., Niehus, T., Younger, W.J., 2012. Handbook of Energy Audits, 9th ed. Routledge, Taylor and Francis
- Van Guilder, C.V., 2014. Environmental Audits. Mercury Learning & Information.

Suggested readings

- Barton, H., and Bruder N., 1993. A Guide to Local Environmental Auditing. Routledge, Taylor and Francis

DOCUMENT PREPARATION & PRESENTATION SOFTWARE

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/Practice		
Document Preparation & Presentation Software	2	0	0	2	12th Pass	NIL

Learning Objectives:

- To develop proficiency in the use of document preparation software such as document LaTeX, LibreOffice.
- To make a presentation using LaTeX, LibreOffice.
- To serve as a tool for conveying/communicating one's ideas, views, and observations.

Learning outcomes: On completion of the course, a student will be able to

- Create a text document using LaTeX using a standard template.
- Incorporate well-formatted mathematical equations, algorithms, figures, tables and references in a document.
- Use Zotero for reference management.
- Format text, including alignment, emphasis and fonts.
- Handle basic aspects of document structure, including sections, subsections, paragraphs, and bulleted and enumerated lists.
- Page set a document including header, footer, and page numbering.
- Make a presentation.

Syllabus:

Unit 1: Introduction (4 Hours)

1. Create a LaTeX/ LibreOffice document having several paragraphs, including comments in LaTeX.
2. Organize content into sections, including preface/abstract. Using the article and book class of LaTeX. Handling errors.

Unit 2: Styling Pages (6 Hours)

1. Loading and using packages, setting margins, header and footer, and page orientation.
2. Organizing the document into multiple columns

Unit 3: Formatting Content (10 Hours)

1. Formatting text (styles, size, alignment)
2. Adding colours to a block of text/ page
3. Adding ordered and unordered lists
4. Inserting mathematical expressions – subscripts, superscripts, fractions, binomials, aligning equations, operators, Greek and mathematical symbols, and mathematical fonts.

Unit 4: Tables and Figures (10 Hours)

1. Create basic tables
2. Adding different types of borders to a table
3. Merging rows and columns
4. Splitting tables across multiple pages.
5. Incorporating figures and subfigures, explore different properties like rotation and scaling.

Unit 5: Algorithms and Equations (12 hours)

1. Incorporating algorithms, body typesetting, organizing algorithms across multiple pages.
2. Incorporating equations, indentation, and captioning.

Unit 6: Referencing and Indexing (6 hours)

1. Insert captions, labels, and references
2. Incorporate cross-referencing (refer to sections, table, and images)
3. Incorporate a bibliography
4. Create a back index.

Unit 7: Making Presentations (12 hours)

1. Create a slideshow
2. Incorporate logo
3. Highlight important points
4. Create a title page
5. Make a table of contents
6. Incorporate special effects in a slideshow.

Practical Exercises:

For the following figures, create LaTex documents using concepts from above:

1.

Hello World!

Prof. Naveen Kumar

November 15, 2022

Hello World! Today I am learning LaTeX. LaTeX is a great program for writing math. I can write in line math such as $a^2 + b^2 = c^2$. I can also give equations their own space:

$$\gamma^2 + \theta^2 = \omega^2$$

2.

Integrals, Sums and Limits

Dr. Neeraj Kumar Sharma

1 Integrals

Integral $\int_a^b x^2 dx$ inside text.

The same integral on display:

$$\int_a^b x^2 \, dx$$

and multiple integrals:

$$\iint_V \mu(u, v) \, du \, dv$$

$$\iiint_V \mu(u, v, w) \, du \, dv \, dw$$

$$\oint_V f(s) \, ds$$

2 Sums and products

Sum $\sum_{n=1}^{\infty} 2^{-n} = 1$ inside text.

The same sum on display:

$$\sum_{n=1}^{\infty} 2^{-n} = 1$$

Product $\prod_{i=a}^{b} f(i)$ inside text.

The same product on display:

$$\prod_{i=a}^{b} f(i)$$

3 Limits

Limit $\lim_{x \to \infty} f(x)$ inside text.

The same limit on display:

$$\lim_{x \to \infty} f(x)$$

3.

Equations

Prof. Naveen Kumar[1], Dr. Neeraj Kumar Sharma[2], and Sakeena Shahid[3]

[1]Department of Computer Science, University of Delhi
[2]Ram Lal Anand College, University of Delhi
[3]SGTB Khalsa College, University of Delhi

November 15, 2022

1 Maxwell's Equations

"Maxwell's equations" are named for James Clark Maxwell and are as follow:

$$\vec{\nabla} \cdot \vec{E} = \frac{\rho}{\epsilon_0} \quad \text{Gauss's Law} \quad (1)$$

$$\vec{\nabla} \cdot \vec{B} = 0 \quad \text{Gauss's Law for Magnetism} \quad (2)$$

$$\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t} \quad \text{Faraday's Law of Induction} \quad (3)$$

$$\vec{\nabla} \times \vec{B} = \mu_0 \left(\epsilon_0 \frac{\partial \vec{E}}{\partial t} + \vec{J} \right) \quad \text{Ampere's Circuital Law} \quad (4)$$

Equations 1, 2, 3, and 4 are some of the most important in Physics.

2 Matrix Equations

$$\begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{pmatrix} \begin{bmatrix} v_1 \\ v_2 \\ \vdots \\ v_n \end{bmatrix} = \begin{matrix} w_1 \\ w_2 \\ \vdots \\ w_n \end{matrix}$$

4.

List of mathematical functions:

- Trigonometric functions
  - sine
  - cosine
  - tangent
- Special functions
  - Beta function
  - Gamma function
  - Riemann zeta function

5. Add the following algorithm to the document.

Algorithm 1: Example code

Input: Your Input
Output: Your output
Data: Testing set x

```
1  ∑_{i=1}^{∞} := 0                                   // this is a comment
   /* Now this is an if...else conditional loop                          */
2  if Condition 1 then
3  |  Do something                                   // this is another comment
4  |  if sub-Condition then
5  |  |  Do a lot
6  else if Condition 2 then
7  |  Do Otherwise
   |  /* Now this is a for loop                                          */
8  |  for sequence do
9  |  |  loop instructions
10 else
11 |  Do the rest
   /* Now this is a While loop                                           */
12 while Condition do
13 |  Do something
```

6.

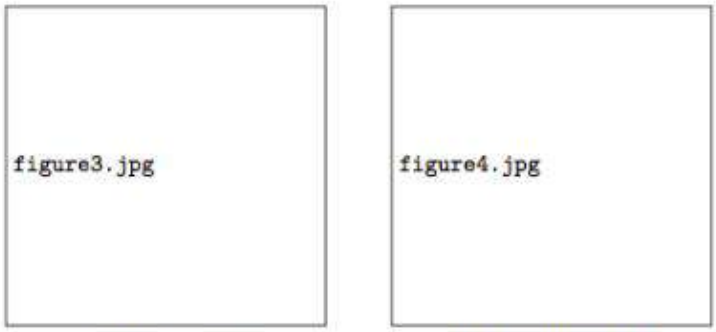
col1	col2	col3
Multiple row	cell2 cell5 cell8	cell3 cell6 cell9

7.

Country List		
Country Name or Area Name	ISO ALPHA 2 Code	ISO ALPHA 3
Afghanistan	AF	AFG
Aland Islands	AX	ALA
Albania	AL	ALB
Algeria	DZ	DZA
American Samoa	AS	ASM
Andorra	AD	AND
Angola	AO	AGO

8. Insert four sub-figures as given below, and add captions. Also, refer to these sub-figures in the text.

(a) Subfigure 1 caption (b) Subfigure 2 caption



(c) Subfigure 3 caption (d) Subfigure 4 caption

Figure 1: This is a figure containing several subfigures.

In the text, you can refer to subfigures of figure 1 as 1a, 1b, 1c and 1d and to the sub-index as (a), (b), (c) and (d).

9. Add a table of contents, a list of figures, and a list of tables in the document as given below.

Contents

List of Tables

List of Figures

10. Add a list of references in the document as given below and cite them in the text.

This document is an example of `natbib` package using in bibliography management. Three items are cited: *The LaTeX Companion* book [2], the Einstein journal paper Einstein [1], and the Donald Knuth's website [3]. The LaTeX related items are [2, 3].

References

[1] A. Einstein. Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. *Annalen der Physik*, 322(10):891–921, 1905. doi: http://dx.doi.org/10.1002/andp.19053221004.

[2] M. Goossens, F. Mittelbach, and A. Samarin. *The LaTeX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.

[3] D. Knuth. Knuth: Computers and typesetting. URL `http://www-cs-faculty.stanford.edu/~uno/abcde.html`.

############################## **END** ##########################

ANUVAD KALA
(Art of Translation)
(अनुवाद कला)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
ANUVAD KALA (Art of Translation) (अनुवाद कला)	2	1	0	1	Class 12th pass in any subject	Working Knowledge of the concerned language

Credits: 2 **L/T/P= 1/0/1**

LEARNING OBJECTIVES:

- The course is committed to continue its pioneering work in defining new literary paradigms and fostering new directions for exploration in literary studies, including such areas as the relationship between translation and transnationalism.
- To develop a deeper appreciation of cultural diversity by introducing the technique of translation studies.
- To develop the creativity of the students and enhance their writing skills

LEARNING OUTCOMES:

- Students will have an understanding of major approaches to the study of translation.
- They will be able to identify, analyse, interpret and describe the critical ideas, values, and themes that appear in literary texts and to understand the ways these ideas, values, and themes, inform and impact cultures and societies both in source language and its translated version.
- They will be able to improve their skill of translation.

Unit I: ਅਨੁਵਾਦ ਸਿਧਾਂਤ- अनुवाद सिद्धांत (Translation Principles) (4 weeks)

- ਅਨੁਵਾਦ ਦੀ ਪਰਿਭਾਸ਼ਾ, ਪ੍ਰਕਿਰਤੀ ਅਤੇ ਮਹੱਤਵ

  अनुवाद की परिभाषा, प्रकृति और महत्व

  Definition, nature and importance of translation
- ਅਨੁਵਾਦ ਦੇ ਸੰਦ: ਕੋਸ਼, ਕੋਸ਼ਾਂ ਦੇ ਵਿਭਿੰਨ ਪ੍ਰਕਾਰ, ਪਰਿਭਾਸ਼ਕ ਸ਼ਬਦਾਂ ਦਾ ਗਿਆਨ ਹਾਸਿਲ ਕਰਨਾ

  अनुवाद उपकरण: शब्दकोश, विभिन्न प्रकार के शब्दकोश, परिभाषिक शब्दों का ज्ञान प्राप्त करना

  Translation tools: Dictionaries, different types of dictionaries, gaining knowledge of defining words
- ਅਨੁਵਾਦ ਦੇ ਰੂਪ: ਮਨੁੱਖੀ ਅਤੇ ਮਸ਼ੀਨੀ

  अनुवाद के रूप: मानवी और मशीनी

Forms of translation: human and machine

Unit II: ਅਨੁਵਾਦ ਕਾਰਜ ਨੂੰ ਦਰਪੇਸ਼ ਚੁਣੌਤੀਆਂ-अनुवाद प्रक्रिया में आने वाली चुनौतियाँ

(Challenges to the translation process) (4 weeks)

- ਵਿਭਿੰਨ ਖੇਤਰਾਂ ਲਈ ਅਨੁਵਾਦ ਦੇ ਮਸਲੇ (ਮੈਡੀਕਲ, ਤਕਨਾਲੋਜੀ, ਵਿਗਿਆਨ)

  विभिन्न क्षेत्रों के लिए अनुवाद के मुद्दे (चिकित्सा, प्रौद्योगिकी, विज्ञान)

  Translation issues for various fields (Medical, Technology, Science)
- ਮਸ਼ੀਨੀ ਅਨੁਵਾਦ ਨਾਲ ਸੰਬੰਧਤ ਮਸਲੇ

  मशीनी अनुवाद से संबंधित मुद्दे

  Issues related to machine translation
- ਸਭਿਆਚਾਰਕ ਵਖਰੇਵੇਂ ਕਾਰਨ ਉਪਜੀਆਂ ਚੁਣੌਤੀਆਂ

  सांस्कृतिक विभिन्नताओं से उत्पन्न चुनौतियाँ

  Challenges arising from cultural differences

Unit III: ਸਾਹਿਤਕ ਅਨੁਵਾਦ: ਹਿੰਦੀ/ਅੰਗਰੇਜ਼ੀ ਤੋਂ ਪੰਜਾਬੀ - साहित्यिक अनुवादः हिंदी/अंग्रेजी से पंजाबी **-Literary Translation: Hindi/English to Punjabi) (4 weeks)**

- ਕਵਿਤਾ ਦਾ ਅਨੁਵਾਦ ਕਰਨਾ

  कविता का अनुवाद

  Translating poetry
- ਕਹਾਣੀ ਦਾ ਅਨੁਵਾਦ ਕਰਨਾ

  कहानी का अनुवाद

  Translating Short Story
- ਵਾਰਤਕ ਰਚਨਾ ਦਾ ਅਨੁਵਾਦ ਕਰਨਾ

  गद्य कृति का अनुवाद

  Translating prose

Unit IV: ਜਨ ਸੰਚਾਰ ਹਿੰਦੀ/ਅੰਗਰੇਜ਼ੀ ਤੋਂ ਪੰਜਾਬੀ- जनसंचार हिंदी/अंग्रेजी से पंजाबी

(Mass Communication Hindi/English to Punjabi) (3 weeks)

- ਖ਼ਬਰ ਦਾ ਅਨੁਵਾਦ ਕਰਨਾ

  समाचार का अनुवाद

  Translating news
- ਇਸ਼ਤਿਹਾਰ ਦਾ ਅਨੁਵਾਦ ਕਰਨਾ

  विज्ञापनों का अनुवाद

  Translating Advertisement
- ਨੋਟਿਸ ਦਾ ਅਨੁਵਾਦ ਕਰਨਾ

  नोटिस का अनुवाद

  Translating Notice

ESSENTIAL READINGS:

- Bhola Nath Tiwari (2018), Anuvad Vigyan, Kitabghar Prakashan, Delhi.
- Bijay Kumar Das (2005), **A Handbook of Translation Studies**, Atlantic Publishers and Distributors Pvt Ltd, Delhi.
- Jaspal Kaur (Dr.) 2013, **Anuvad te Maukhik Anuvad Kala**, Manpreet Parkashan, Delhi.
- Ram Chander Verma Shashtri "n.d.", **Anuvad Kala**, Ashok Prakashan, Delhi.
- Sushil Kumar (2003), **Anuvad da Samvaad**, Udaan Publication, Mansa.

SUGGESTED READINGS:

- Morley, David (2007), **The Cambridge Introduction to Creative Writings,** New York, Cambridge.
- Robinson, Peter (2010), **Poetry and Translation**, Liverpool University Press, England.
- Ray, Mohit K. (Ed.) (2008), **Studies in Translation**, Atlantic Publishers, Delhi.

(Note: Teachers are free to recommend additional related standard source books, if required so.)

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

SIRJNNATMAK LEKHAN
(Creative Writing)
(सृजनात्मक लेखन)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
SIRJNNATMAK LEKHAN (Creative Writing) (सृजनात्मक लेखन)	2	1	0	1	Class 12th pass in any subject	Working Knowledge of the concerned language

Credits: **2** **L/T/P= 1/0/1**

LEARNING OBJECTIVE:

- To understand and appreciate skill of creative writing. To understand main ideas and details in different aspects of creative writing.
- To understand the contemporary position of Punjabi mass media and importance of creative writing in this field.
- To understand the importance of the skill of creative writing in the profession of electronic media.

LEARNING OUTCOMES:

- Students will demonstrate an understanding of terms, themes, strategies to learn the skill of creative writing. ·
- They can express their understanding of the relationship between Punjabi mass media (print and electronic) and the skill of creative writing. ·
- To know the scope of creative writing as a profession.

UNIT I ਸਾਹਿਤ ਸਿਰਜਣਾ: ਬੁਨਿਆਦੀ ਨੁਕਤੇ– साहित्य सृजनरू मूल बिंदु **(Literary Creation: Basic Points)** **(3 weeks)**

- ਸਾਹਿਤ ਦੀ ਪਰਿਭਾਸ਼ਾ, ਸਰੂਪ ਅਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ

  साहित्य की परिभाषा, सवरूप और विशेषताएं

  Definition, scope and characteristics of literature

- ਸਾਹਿਤ ਅਤੇ ਸਮਾਜ: ਪਰਸਪਰ ਅੰਤਰ-ਸੰਬੰਧ

साहित्य और समाज: परस्पर अंतर्संबंध
Literature and Society: Mutual Interrelation

- ਸਾਹਿਤ ਅਤੇ ਹੋਰ ਅਨੁਸ਼ਾਸਨ: ਮਨੋਵਿਗਿਆਨ, ਦਰਸ਼ਨ ਸ਼ਾਸਤਰ ਅਤੇ ਸਮਾਜ ਸ਼ਾਸਤਰ

साहित्य और अन्य अनुशासन: मनोविज्ञान, दर्शन शास्त्र और समाज शास्त्र
Literature and other disciplines: Psychology, Philosophy and Sociology

Unit II ਕਾਵਿ ਲੇਖਣ - कविता लेखन **(Poetry writing)** **(4 weeks)**

- ਕਵਿਤਾ: ਪਰਿਭਾਸ਼ਾ, ਰੂਪ ਅਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ

काव्य: परिभाषा, रूप और विशेषताएं
Poetry: definition, forms and characteristics

- ਕਾਵਿ ਭਾਸ਼ਾ, ਕਾਵਿ-ਬਿੰਬ ਅਤੇ ਪ੍ਰਤੀਕ, ਛੰਦ, ਬਹਿਰ

काव्य भाषा, काव्य बिंब और प्रतीक, छंदए बहर
Poetic language, poetic images and metaphors, verse

- ਗੀਤ, ਗ਼ਜ਼ਲ ਅਤੇ ਖੁੱਲ੍ਹੀ ਕਵਿਤਾ ਦੀ ਸਿਰਜਣਾ ਕਰਨਾ

गीतों, ग़ज़लों और छंद मुक्त कविता की रचना
Composing songs, ghazals and open verse

Unit III ਕਹਾਣੀ ਲੇਖਣ - लघुकथा लेखन **(Short Story writing)** **(4 weeks)**

- ਨਿੱਕੀ ਕਹਾਣੀ: ਪਰਿਭਾਸ਼ਾ, ਸਰੂਪ ਅਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ

लघुकथा: परिभाषा, सवरूप और विशेषताएं
Short Story: definition, scope and characteristics

- ਕਥਾਨਕ, ਪਾਤਰ ਚਿਤਰਣ, ਵਾਰਤਾਲਾਪ ਅਤੇ ਭਾਸ਼ਾ ਸ਼ੈਲੀ

कथानक, चरित्र चित्रण, संवाद और भाषा शैली
Plot, characterization, dialogue and language style

- ਨਿੱਕੀ ਕਹਾਣੀ ਲੇਖਣ

लघुकथा लेखन
Composing a short story

Unit IV ਨਿਬੰਧ ਲੇਖਣ- निबंध लेखन **(Essay writing)** **(4 weeks)**

- ਨਿਬੰਧ: ਪਰਿਭਾਸ਼ਾ, ਸਰੂਪ ਅਤੇ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ

निबंध: परिभाषा, सवरूप और विशेषताएं
Essay: definition, scope and characteristics

- ਵਿਸ਼ੇ ਦੀ ਚੋਣ ਅਤੇ ਲੋੜੀਂਦੀ ਸਮੱਗਰੀ ਦੀ ਖੋਜ

विषय का चयन और आवश्यक सामग्री की खोज
Selection of topic and search of required material

- ਨਿਬੰਧ ਲੇਖਣ

निबंध लेखन
Composing an essay

ESSENTIAL READING:

- Aabid Ali And Sandeep Kumar, 2017, **Creative and Mass Writing Methods**, Nirmal Publishing House, Kurukshetra.
- Anjana Neira Dev, Marwah Anuradha and Pal Swati, (2008), **Creative Writing: A Beginner's Manual**, Pearson Education India, Delhi.
- Jaggi, Rattan Singh, (2003), **Sahit de Roop**, Punjabi University, Patiala.
- Jagjit Kaur (Dr.) & Manjit Singh (Dr.) (eds.), (2013), **Sirjnnatmak Lekhan ate Jan-Sanchar Madhiyam**, Manpreet Parkashan, Delhi.

SUGGESTED READING:

- Dil, Balbir Singh (1991), **Punjabi Nibandh: Saroop, Sidhant ate Vikas,** Punjabi University, Patiala.
- Gautam, Ramesh (2016), Madhuri Sabodh, Rajinder Gautam and Prabhat Ranjan, **Rachnatmak Lekhan,** Bhartiya Jnanpith, New Delhi.
- Joginder Singh (Prof.), **Pinal te Arooz,** Punjabi Sahit Academi, Ludhiana.
- Phul, Gurdial Singh (Prof.), Suri, Kartar Singh (Prof.) (1954), **Naval Kala te Punjabi Navalkari,** Lok Sahit te Parkashan, Amritsar.
- Sidhu, Gurumail (2020), **Khulli Kavita De Maapdandh,** Chetna Parkashan, Ludhiana.

INTERNET LINKS:

- ਕਵਿਤਾ ਕਿਵੇਂ ਲਿਖੀਏ ਲਈ ਲਿੰਕ: https://www.youtube.com/watch?v=X2LtYOJuJd8
- ਕਹਾਣੀ ਕਿਵੇਂ ਲਿਖੀਏ ਲਿੰਕ: https://www.youtube.com/watch?v=IkZ69t1G5Zc
- ਪੰਜਾਬੀ ਸਾਹਿਤ ਬੋਧ ਲਈ ਲਿੰਕ: https://punjabilibrary.com/product/punjabi-sahit-bodh/
- ਨਾਵਲ ਕਲਾ ਤੇ ਪੰਜਾਬੀ ਨਾਵਲਕਾਰ ਲਈ ਲਿੰਕ:
  http://www.panjabdigilib.org/webuser/searches/displayPage.jsp?ID=7263&page=1&CategoryID=1&Searched

*(Note: Teachers are free to recommend additional related standard source books, if required so.)

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

COMPUTER AND URDU INPAGE-I

CREDITDISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (ifany)
		Lecture	Tutorial	Practical/ Practice		
Computer and Urdu Inpage-I	**2**	**1**	-	**1**	12th Pass	Basic knowledge of Urdu

Learning Objectives

The Learning Objectives of this course are as follows:

- Through this course students will able to learn about basic knowledge of computer.
- To help students in understanding the principles and techniques of using Urdu Inpage software.

Learning Outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to use the basic software of computer
- After studying this course, students will be able to demonstrate the skill of using Urdu Inpage.

SYLLABUS :

UNIT – I (1-7 Weeks)

1. Computer ek Taarruf
2. Computer ki Khususiyaat

UNIT – II (8-14 Weeks)

3. Inpage Urdu ke baare mein
4. Inpage Urdu ka Chalna/Chalana
5. Mashq: Inpage Urdu se mutalliq ibtedaai maloomaat

Note: Portfolio mein kam se kam 2 experiment pesh karna lazmi hai.

Practical component (if any) –

- Students are required to practice on computer.
- Students are required to present at least two experiments at the time of practical examination.

Essential/recommended readings:

1. Inpage Urdu - Mohammad Firoz Hashmi
2. Computer Guide - Mohammad Munir Qureshi
3. Ibtedai Computer Training Course - Naeem Ahsan
4. Computer ki Duniya - Mohammad Ehteshamuddin

Suggestive readings:

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

Examination scheme and mode:

Total Marks:100
Internal Assessment: 25 marks
Practical Exam (Internal): 25marks
End Semester University Exam: 50 marks
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

COMPUTER AND URDU INPAGE-II

CREDITDISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (ifany)
		Lecture	Tutorial	Practical/ Practice		
Computer and Urdu Inpage-II	2	1	-	1	12th Pass	Basic knowledge of Urdu

Learning Objectives

The Learning Objectives of this course are as follows:

- Through this course students will able to learn about detailed knowledge of Urdu inpage
- To help students in understanding the principles and techniques of using Urdu Inpage software.

Learning Outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to use the detailed knowledge of Urdu inpage
- After studying this course, students will be able to demonstrate the skill of using Urdu Inpage.

SYLLABUS:

UNIT – I (1-7 Weeks)

1. Inpage ke Objectives
2. Text box

UNIT – II (8-14 Weeks)

3. Texts ki Ibtedai Formatting
4. Master Page
5. Mashq: Inpage ke objectives, Text box aur uski formatting, Master Page

Note: Portfolio mein kam se kam 2 experiment pesh karna lazmi

hai.

Practical component (if any) –

- Students are required to practice on computer.
- Students are required to present at least two experiments at the time of practical examination.

Essential/recommended readings:

1. Inpage Urdu - Mohammad Firoz Hashmi
2. Computer Guide - Mohammad Munir Qureshi
3. Ibtedai Computer Training Course - Naeem Ahsan
4. Computer ki Duniya - Mohammad Ehteshamuddin

Suggestive readings:

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

Examination scheme and mode:

Total Marks:100
Internal Assessment: 25 marks
Practical Exam (Internal): 25marks
End Semester University Exam: 50 marks
The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty

Innovation and Entrepreneurship

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical /Practice		
Innovation and Entrepreneurship	2			2	NIL	NIL

Learning Objectives

The primary objectives of the course will be to:

- Encourage the process of creative thinking and innovation
- Build an entrepreneurial perspective to identify and tackle problems and explore new opportunities
- Gain insight into building business models and plans
- Identify tools and strategies that entrepreneurs may use for start-up, innovation and reinvention
- Understand how to go from an idea to product and scale it up for sustainability
- Develop skills to work in teams and build connections, collaborations and social networks .

Learning Outcomes

By the end of the course students should be able to:

- Identify and comprehend the concepts of creativity, innovation and invention in various contexts.
- Enrich their theoretical and conceptual foundations in entrepreneurship.
- Gain hands-on experience that shall empower them to identify business and social opportunities and venture in the entrepreneurial landscape.
- Prepare themselves to take informed decisions in establishing start-ups and ongoing innovation in organisations
- Work as a team

PEDAGOGY

While suitable concepts and theory will be utilized, the emphasis of the course will be on inquiry driven hands-on activities and experiential learning in a team setting. As this is essentially a group activity based course, the two lectures scheduled for each week shall be held

together. The class to be split up ideally in groups of 5 – 7 students each, who will work together for the rest of the semester on identifying a specific problem and by semester-end present a feasible innovative prototype capable of being funded as a start-up.

SYLLABUS

Unit I: Understanding Creativity

- Understanding the concept and process of creativity; students exploring within themselves the nature of the creative process; approaches to understanding creativity (Ref. B1)
- Differentiate between invention and innovation (Ref. OR1)
- Understanding entrepreneurial mindset and skills (creativity, decision making, risk taking behaviour, networking) and entrepreneurship in different contexts (eg. Social, Cooperative, Commercial, Public, Not for Profit organisations) (Ref. B1)
- Case studies of some successful innovations/start-ups – Different group can be given a different Case Study and the groups can have a discussion on same (Ref. Suggestive Case Studies A)

(12 practical hours)

Unit II: Ideation

- Identifying a specific problem through observation, contemplation, networking and research (Ref. B2)
- Generating ideas for problem solving using mind mapping, brainstorming, focus groups, idea generation tool kit (SCAMPER) (Ref. B1)
- Learning through failures of others – case studies of some ventures that could not sustain – Different group can be given a different Case Study and the groups can have a discussion on same (Ref. Suggestive Case Studies B)

(12 practical hours)

Unit III: Understanding the business

- Building a business plan using the lean canvas model (Ref. OR2)
- Understanding customers/stakeholders and evaluating the business plan through survey/questionnaire/interview/secondary research (Ref. B1 and B2)
- Designing, prototyping and iteration (Ref. B2)
- Networking and growth strategies (Ref. B3)
- Building and managing organisations (Ref. B3)
- Role of leadership and team based culture (Ref. B3 and OR4)

(16 practical hours)

Unit IV: Venturing Forth

- Financing the innovation: pitching and communicating the idea
- Sources of finance: crowdfunding, venture capital, equity funds, angel investing, borrowing (including government initiatives, bank and public funded schemes) (Ref. OR5 and OR6)
- Various forms of IPR (patent, copyright, trademark, geographical indication, industrial design) (Ref. OR7 and OR8)
- Setting and scaling up (Ref. B3)
- Entrepreneurial resilience and ongoing creativity (Ref. B1)

(8 practical hours)

Suggested Readings: Books

B1.The Innovator's DNA: Mastering the Five Skills of Disruptive Innovators, Jeff Dyer, Hal Gregersen, C.M. Christensen, Harvard Business Review Press, 2011

B2. Design Thinking: Business Innovation, Maurício Vianna, Ysmar Vianna, Isabel K. Adler, Brenda Lucena, Beatriz Russo, MJV Press, 1st Electronic Edition, 2011
(also available at https://cdn2.hubspot.net/hubfs/1701231/Documents/Design_Thinking_-_The_Book/Design_Thinking_The_Book.pdf)

B3. Contemporary Strategy Analysis: Text and Cases, Robert M Grant, Wiley, 9th Edition,2016 (Chapter 6 and Chapter 9)

Online Resources

OR1. Discovery, Innovation and Invention
https://www.laits.utexas.edu/~anorman/long/DII.html

OR2. How to create your lean canvas
https://leancanvas_production.s3.amazonaws.com/cms/LeanCanvas.pdf

OR3. Organisational behaviour and human relations, Module 12, Creativity in decision making
https://courses.lumenlearning.com/wm-organizationalbehavior/

OR4. Organisational behaviour and human relations, Module 13, Leadership
https://courses.lumenlearning.com/wm-organizationalbehavior/

OR5. Sources of Funding Innovation and Entrepreneurship
https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020-chapter4.pdf

OR6. Government Schemes for Startups
https://www.startupindia.gov.in/content/sih/en/government-schemes.html

OR7. Intellectual Property Rights in India
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627956/IP-Rights-in-India.pdf

OR8. What is Intellectual Property? WIPO 2020 doi:10.34667/tind.42176
https://www.wipo.int/publications/en/details.jsp?id=4528

Suggestive Case Studies A
1. Amul
2. Goonj
3. Aravind Eye care systems
4. Apple
5. Pixar
6. ISRO
7. Khan Academy
8. Nyka
9. Swiggy

10. Sulabh International
11. OYO
12. Mumbai's Dabbawalas
13. Lijjat Papad
14. Jaipur Rugs
15. WOW! Momo
16. Biryani by Kilo

Suggestive Case Studies B

1. Nokia
2. Cafe Coffee Day
3. HMT watches
4. Atlas Cycles
5. Jet Airways
6. Kodak
7. Stayzilla
8. SKS Microfinance IPO
9. Satyam Computers
10. Groupon Inc.

Weekly Plan:

Week I: Understanding the concept and process of creativity; Approaches to understanding creativity; differentiate between invention and innovation.

Week II: Activity week - Students exploring within themselves the nature of the creative process in groups (eg. exploring the surroundings for possible problems and challenges that may have innovative solutions).

Week III: Understanding entrepreneurial mindset and skills (creativity, decision making, risk taking behaviour, networking) in different contexts through discussion of a case study (may select one case study from Suggestive Case Studies A).

Weeks IV - IX: Activity Weeks - The class to be split up ideally in groups of 5 – 7 students each, who will work together for the rest of the semester on identifying a specific problem and by semester-end present a feasible innovative prototype capable of being funded as a start-up.

Week IV: To begin with, each group shall identify a problem through observation, contemplation, brainstorming, networking and research.

Week V: Each group to generate ideas for solving their identified problem using mind mapping, focus groups, idea generation tool kit (SCAMPER).

Week VI: Each group to critically assess the feasibility of the proposed ideas by learning through the failures of others – case studies of some ventures that could not sustain (may use a case study from Suggestive Case Studies B).

Week VII: Each group to build a business plan using the lean canvas model and survey/questionnaire/interview/secondary research.

Week VIII: Each group to design and prototype their proposed business solution/model/product.

Week IX: The groups evaluate their proposed business plan/model using feedback from networking. Submission of formal business plan (written) by each group.

Week X: Formulating growth/scaling up strategies*;* building and managing organisations*;* role of leadership and team based culture, *e*ntrepreneurial resilience and ongoing creativity.

Week XI: Financing the innovation: pitching and communicating the idea. Sources of finance: crowdfunding, venture capital, equity funds, angel investing, borrowing (including government initiatives, bank and public funded schemes)

Week XII: Various forms of IPR (patent, copyright, trademark, geographical indication, industrial design)

Week XIII and Week XIV: Activity weeks - Submission of final project report (written) and presentation (oral) by each group, Viva.

Assessment: The evaluation shall be done in continuous assessment mode based on assessing the quality of participation shown by the students and the skill developed. The rationale behind this scoring scheme is to assess students on their effort, enthusiasm and participation rather than merely the final outcome achieved. The suggestive assessment modes are Class participation;, Creativity; Group projects in form of business model development and its presentation.

IT Skills and Data Analysis - I

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical /Practice		
IT Skills and Data Analysis - I	2			2	NIL	NIL

Learning Objectives

The primary objectives of the course will be to

- Familiarise the student with the quantitative skills required for representing and interpreting data for the purpose of decision making.
- Equip the student with some fundamental concepts, which play a critical role in understanding and visualizing real world data.
- Enable the student to analyze data and problem situations using relevant IT tools.

Learning Outcomes

By the end of the course students will be able to

- Represent and interpret data in tabular and graphical forms
- Understand and interpret the measures of central tendency and dispersion.
- Use IT tools such as spreadsheets to visualise and analyse data.

PEDAGOGY

Relevant concepts and theory will be introduced which will be supplemented by hands-on activities enabled by the use of spreadsheets. This is a two credit course and will comprise two lecture periods per week. As this is essentially an activity-based course, it will involve two consecutive lecture periods, once in a week.

SYLLABUS

Unit I : What is Statistics ? (Weeks 1 - 6)

This unit provides an introduction to the fundamentals of datasets, sources of data, frequency distributions and graphical representations of data. The aim is to give students a hands-on experience of initiating data analysis through a spreadsheet.

- Concept of datasets (Variables, Observations)
  Reference 1, Chapter 2
- Different types of variables (Quantitative and Qualitative)
  Reference 1, Chapter 2
- Distinction between primary and secondary sources of data
  Reference 1, Chapter 2
- Basic idea of using questionnaire to collect primary data for analysis
  Reference 2, Chapter 1 [Section 1.6]
- How to construct a questionnaire
  Reference 1, Chapter 1
- Concept of frequency distribution: cumulative and relative frequencies
  Reference 2, Chapter 2
- Introduction to spreadsheet
  Reference 2, Chapter 2
- Tabular and graphical presentation of data: data tables, frequency curve, histogram, bar graphs, pie charts (through the use of spreadsheets)
  Reference 2, Chapter 2

Unit II: Measures of Central Tendency and Dispersion (Weeks 7 - 14)

The focus of this unit will be to familiarise the student with summary statistics to describe datasets. In particular, two important characteristics of data, viz., central tendency and dispersion, will be used to summarise datasets using a spreadsheet. The concept of the Normal distribution and its characteristics will be discussed to highlight its relevance in modelling real life phenomenon.

- Measures of central tendency: mean, median, mode
  Reference 2, Chapter 3
- Examples of situations where it is appropriate to use the mean, median and mode as a measure of central tendency
  Reference 2, Chapter 3
- Weighted mean
  Reference 2, Chapter 3
- Measures of dispersion: range, variance, standard deviation
  Reference 2, Chapter 3

- Quartiles, deciles and percentiles
  Reference 2, Chapter 3
- Visualize the measures of central tendency and dispersion through frequency curve and histogram
  Reference 2, Chapter 3
- Skewness and kurtosis
  Reference 2, Chapter 3
- Normal curve and its basic properties : visual representation of population characteristics (height, weight, IQ etc.)
  Reference 2, Chapter 5 [Section 5.6]

References (Readings and Resources)

1. Rowntree, D., Statistics without tears - A primer for non-mathematicians, Allyn and Bacon, 2018.
2. Levin, Rubin, Rastogi and Siddiqui, Statistics for Management, 7th Edn, 2014

Suggested Data Sources

The following data sets are suggested to carry out the activities

1. https://data.worldbank.org/
2. https://www.statista.com/
3. https://data.gov.in/
4. https://censusindia.gov.in/
5. https://www.kaggle.com/
6. http://data.un.org/

Evaluation Scheme

As per University Guidelines

Weekly Plan

Weeks I and II: Students learn about the concept of datasets (Variables, Observations) ; Different type of Variables (Quantitative and Qualitative); Distinction between primary and secondary sources of data

Weeks III and IV: Basic idea of using questionnaire and how to construct a it; Concept of frequency distribution - cumulative and relative frequencies; Introduction to spreadsheet

Weeks V and VI: Tabular and graphical presentation of data: data tables, frequency curve, histogram, bar graphs, pie charts. Students to explore various representations on spreadsheet using datasets

Weeks VII and VIII: Introduction of Measures of Central Tendency: Mean, Median, Mode through appropriate examples explaining the use of each one of them in various situations. Understanding the concept of Weighted mean;

Weeks IX and X: Measures of dispersion: Range, Variance, Standard deviation; Visualizing the measures of central tendency and dispersion through frequency curve and histogram. Understanding Quartiles, deciles and percentiles numerically.

Weeks XI and XII: Representation of population characteristics using the basic properties of a Normal Curve, skewness and kurtosis.

Weeks XIII and XIV: Assignments based on Units 1 and 2 using spreadsheets to consolidate the learning of concepts covered.

IT Skills and Data Analysis - II

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical /Practice		
IT Skills and Data Analysis - II	2			2	NIL	IT Skills and Data Analysis - I

Learning Objectives

The primary objectives of the course will be to

- Familiarise the student with the quantitative skills required for corelating the data for the purpose of decision making.
- Equip the student to visualise functions which play a critical role in understanding and visualizing real world data.
- Enable the student to analyze data and problem situations using relevant IT tools.

Learning Outcomes

By the end of the course students will be able to

- Establish relationships between variables using correlation and regression analysis.
- Visualize functions and differentiate between linear and nonlinear functions.
- Use IT tools such as spreadsheets to visualise and analyse data.

PEDAGOGY

Relevant concepts and theory will be introduced which will be supplemented by hands-on activities enabled by the use of spreadsheets. This is a two credit course and will comprise two lecture periods per week. As this is essentially an activity-based course, it will involve two consecutive lecture periods, once in a week.

SYLLABUS

Unit I: Functions and their graphical representations (Weeks 1 - 4)

This unit introduces the graphical visualisation of functions to understand the relationship between two variables.

- Definition and graphical representation of a function, vertical line test
  Reference 3
- Polynomial functions: linear, quadratic and cubic functions
  Reference 3
- Reciprocal, exponential and logarithmic functions
  Reference 3
- Concept of slope of a function through graphical representation
  Reference 3

Unit II: Relationship between Variables (Weeks 5 - 11)

Students will learn about scatter diagrams and correlation analysis as a means to describe the nature and strength of association between two variables. The concept of regression analysis will be introduced as a method for quantifying the relationship between two variables. Further, multiple linear regression will be discussed for situations where more than one independent variable is needed to estimate the dependent variable. The focus will be mainly on interpreting estimated regression coefficients.

- Scatter diagrams
  Reference 2, Chapter 12
- Correlation analysis : measure and interpretation of correlation coefficient and coefficient of determination
  Reference 2, Chapter 12
- Hypotheses, model specification and testing
  Reference 2, Chapter 12
- Bi-variate regression analysis: method of least squares, curve of best fit as a model for prediction
  Reference 2, Chapter 12
- Multiple Linear Regression
  Reference 2, Chapter 13

Weeks 12 – 14 : Project Presentations and Viva

References (Readings and Resources)

1. Rowntree, D., Statistics without tears - A primer for non-mathematicians, Allyn and Bacon, 2018.
2. Levin, Rubin, Rastogi and Siddiqui, Statistics for Management, 7th Edn, 2014
3. Boundless Algebra : https://courses.lumenlearning.com/boundless-algebra/

Suggested Data Sources

The following data sets are suggested to carry out the activities

1. https://data.worldbank.org/
2. https://www.statista.com/
3. https://data.gov.in/
4. https://censusindia.gov.in/
5. https://www.kaggle.com/
6. http://data.un.org/

Evaluation Scheme

As per University Guidelines

Weekly Plan

Weeks I and II: Understanding the definition of a function; graphical representation of a function and vertical line test; visualising various kinds of functions (Linear, quadratic and cubic functions)

Weeks III and IV: Reciprocal, exponential and logarithmic functions; Interpreting and visualising the concept of slope of a function through graphical representations.

Weeks V and VI: Scatter Diagrams; Correlation analysis - measure and interpretation of correlation coefficient and coefficient of determination.

Weeks VII to IX: Hypotheses, model specification and testing; Understanding Bi-variate Regression analysis: Method of Least Squares; Curve of best fit as a model for prediction.

Weeks X and XI: Multiple Regression Analysis

Weeks XII to XIV: Project Presentations and Viva

Hospital Front Office Operations-1

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Hospital Front Office Operations-1	**2**	**1**	**0**	**1**	**Class XII Pass**	

***Job Role-Hospital Front Office Coordinator**

Learning Objectives

- Create in depth awareness of Front Office processes of the Hospital

Learning outcomes

- Lectures, discussions, presentations, case discussions, exercises, practical and exposure to current practices. The pedagogy for the course is more student centric; Visit to healthcare facilities.
- Students will gain the knowledge of Hospital Front Office Department, various policies of the department and ways of handling different categories of patients.

SYLLABUS :

Unit-1 - Department Overview

- Organization Chart, Scope of Front Office Services, Job Descriptions

Unit-2 - Department Policies & Procedures:

- OPD Management: OPD timings, schedule, registration, billing etc.
- Help desk management
- Appointment handling
- Preventive Health Program Management
- Employees Responsibilities e.g. punctuality, discipline, integrity, grievance redressal process
- Handling different Categories of Patients - Paid / Non-Paid, Emergency, VIPs etc.
- Ensuring Patient Satisfaction
- Effectively Handling Various Problems of OPDs

Practical component (if any) -

Students will be given hands on training for the subject by demonstrations, simulations and role plays.

Essential/recommended readings

N/A

Suggestive readings

- Front Office case studies, SOP of front office and training materials

Note:

1. **Examination scheme and mode shall be as prescribed by the Healthcare Sector Skill Council(HSSC) from time to time.**
2. **This SEC course has been mapped as per the job role of Hospital Front Office Coordinator**

HOSPITAL FRONT OFFICE OPERATONS-2

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Hospital Front Office Operations-2	**2**	**1**	**0**	**1**	**Class XII pass**	

***Job Role-Patient Relations Associate**

Learning Objectives

Create in depth awareness of Front Office processes

Learning outcomes

- Generating awareness and understanding about IPD and Insurance Process of the Hospital
- Students will able to have in depth knowledge about the process and regulations to handle medico-legal cases.

SYLLABUS :

Unit 1(3 Weeks)

- IPD Admission and Discharge Process
- IPD Patient Handling
- Problems associated with IPD Patients
- Medico Legal Case Management

Unit 2(2 Weeks)

- Insurance (TPA) Management Process
- Challenges in Catering to Insurance and other Corporate patients

Unit 3(2 Weeks)

- Maintenance of equipment
- Inventory control
- Managing the higher management

Practical component (if any) –

Students will be given hands on training for the subject by demonstrations, simulations and role plays.

Essential/recommended readings
N/A

Suggestive readings

- Textbook on Medico Legal Issues by Satish Tiwari published by Jaypee Medical
- Front Office case studies, SOP of front office and training materials

Note:

1. **Examination scheme and mode shall be as prescribed by the Healthcare Sector Skill Council(HSSC) from time to time.**
2. **This SEC course has been mapped as per the job role of Patient Relations Associate.**

Occupational Health, Safety and Security

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria/	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Occupational Health, Safety and Security	**2**	**1**	**0**	**1**	**Class XII Pass**	Knowledge of Retail & Commerce

***Job Role-Retail Sales Associate**

Learning Objectives

Introduction to Health and Safety legislation in India and their importance in Retail Store.

Learning outcomes

- **Understanding of Occupational health and safety at workplace.**
- **Measures to retail store security.**

SYLLABUS :

Unit 1: (4 week)

Introduction to Occupational health and safety legislation in India, Health and Safety at work Act 1974, Measures for Store hygiene and cleanliness, Health and Safety of employees.

Unit 2: (3 week)

Theft Act 1968, Preventing inventory shrinkage, Store Safety &Security, Ensure overall safety and security of the store.

Practical component (if any) – Students will be given hands on training for the subject by demonstrations, simulations and role plays.

Essential/recommended readings

N/A

Suggestive readings

- **Kulkarni G K, 2008, Implementation of occupational health legislation at workplace, issues and concerns.**
- **https://labour.gov.in › default › files › OSH_Gazette**

Note:

- **Examination scheme and mode shall be as prescribed by the Retailer's Association Skill Council of India, from time to time.**
- **This SEC course has been mapped as per the job role of Retail Sales Associate.**

Organization and Team Dynamics

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Organization and Team Dynamics	**2**	**1**	**0**	**1**	**Class XII pass**	Knowledge of Retail & Commerce

***Job Role-Retail Team Leader**

Learning Objectives

The course aims to teach students the importance of building teams in business and industry. The course will examine the basic structure of a team, how they are developed their management and evaluation.

Learning outcomes

- **Explore the definition of team and examine unique features of types of Teams**
- **Develop an understanding on various ways of building an effective team**
- **Evaluate techniques to manage teams at each stage of Development**
- **Examine and explore methods and techniques of assessing team performance.**

SYLLABUS :

Unit 1: (4 weeks)
Company Vision, Mission, Values, Job Role of Team Leader and skill sets of a competent Team Leader, Understanding company policies and procedures, Work effectively in your team, Work effectively in your organization

Unit 2: (3 weeks)
Allocate and check work in your team, work effectively in your team, work effectively in your organization, Help maintain healthy and safety.
in shaping consumer opinion, company's role in helping consumers to remember.

Practical component (if any) –
Students will be given hands on training for the subject by demonstrations, simulations and role plays.

Essential/recommended readings
N/A

Suggestive readings

- **Pareek, Udai, Understanding Organizational Behaviour, Oxford University Press, New Delhi.**
- **K., Aswathapa, Organizational Behavior, Himalaya Publishing House.**
- **Robbins, S. P., Judge, T. A., & Vohra , N. (2018). Organizational Behavior (18 ed.). Pearson.**
- **Singh, D. (2003). Emotional intelligence at work. New Delhi: Response Books**

Note:

- **Examination scheme and mode shall be as prescribed by the Retailer's Association Skill Council of India, from time to time.**
- **This SEC course has been mapped as per the job role of Retail Team Leader.**

Spoken Persian – Elementary level

Credit distribution, Eligibility and Pre-requisites of the Course:

Course title& Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Spoken Persian: Elementary level	**2**	**2**	**Nil**	**Nil**	**12th Class Pass**	**Nil**

Learning Objectives

The Learning Objectives of this course are as follows:

- To enable the students to speak daily usage spoken Persian

Learning outcomes

The Learning Outcomes of this course are as follows:

- By learning this course, the students will be able to speak in commonly spoken Persianlanguage
- By learning this course, the students may get a chance to work as a tourist guide.

SYLLABUS :

UNIT – I (3 Weeks)

- Applied Grammar

UNIT – II (3 Weeks)

- Persian conversation techniques

UNIT – III (2 Weeks)

- Translation from Persian to English and vice-versa

Essential/recommended readings

1. Let's Learn Persian (first half of the book; pp. 1-103) NCPUL, MHRD, New Delhi.

2. Gargesh, R. Goswami, Translation and Interpretation, University of Delhi, Delhi.
3. Kumar, Rajinder, Elementary Persian Grammar, Great Book Contractor, Lal Kuan,Delhi-110006, 2018.
4. English Farsi Phrasebook with useful wordlist, US Department of State, WashingtonDC.
5. Sufi, Abdul Aziz, Essentials of Persian Translation, Indo-Iran Society, Lal Kuan, Delhi-06, 1999.

Andragogy: Principles, Methods and Skills

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title& Code	Credits	Credit distribution of thecourse			Eligibility criteria	Pre-requisiteof the course (if any)
		Lecture	Tutorial	Practical /Practice		
Andragogy: Principles, Methods and Skills	**2**	**1**		**1**	**Nil**	**Nil**

Andragogy has emerged as one of the dominant frameworks for teaching adults in the past years. It is an art and science of dealing with Adults. It also deals with the technique of training for Adults. It objectifies the various needs of adults and provided targeted interventions in the field of Teaching-learning and Training.

Learning Objectives:

- Understanding the Basic Conceptions of Andragogy
- Impart the Skills, and techniques of Andragogy in teaching Learning and Training Methods

Learning outcomes

- Imparted the skills for channelizing the process of Andragogy in teaching learning
- Construct the training mechanism and competencies to deal with adult learners
- Application of Andragogy in the field of practice

Course outline:

Unit 1: Basic Conception of Andragogy [Weeks 1-2]

1.1 Concept, Terminologies, and features of Andragogy
1.2 Self-directed learning

Unit 2: Foundation and Debate of Andragogy [Weeks 3–5]

2.1 Sociological and Philosophical Aspects
2.2 Psychological and Behavioral Aspects
3.3 Contemporary Debate between Andragogy and Pedagogy

Unit 3 Techniques & Principles of Andragogy [Weeks 6–8]

3.1 Malcolm Knowles Principles of Andragogy
3.2 Basic Assumptions about the Adults
3.3 Adult Learning Models
3.4 Skill Mapping & Training through Andragogy
3.5 Management of Education Intervention through Androgagy Techniques

Unit 4: Application of Andragogy [Weeks 8-14]

4.1 Andragogy and Training in Industries, Volunteer Organization and Education Institutions
4.2 Practicum under the Institutions in Training Departments and Education Institution

REFERENCES:

Freire, Paulo (1970) *Pedagogy of the Oppressed*, New York : Continuum

Roger, Harrison (Ed.2002) *Supporting Lifelong Education*, London: Rotledge

Knowles, M. (1984). The Adult Learner: A Neglected Species (3rd Ed.). Houston, TX: Gulf Publishing.

Patzold, Henning (2011), Learning and Teaching in Adult Education Contemporary Theories, Barbara Budrich Publishers Opladen& Farmington Hills, ISBN 978-3-86649-443-5.

Palmer, J. A (2001) *Fifty Modern thinkers on Education: Piaget to the present day.* London, Routledge flamer

Caffarella, R. S. (2001). *Planning Programs for Adult Learners: A Practical Guide for Educators, Trainers, and Staff Developers, 2nd Edition*. San Francisco, CA: Jossey-Bass. [ISBN: 0787952257]

Teaching Learning Process:

The Teaching-Learning Process will incorporate innovative ways to engage Adult learners in two ways process. The lecture method along with participatory learning, demonstration method, Classroom Presentation and field exposure will be used.

Assessment Methods:

Class participation, Class exercises, Take-home assignments, Class assignments and field visit report

Career Coaching and Applied Counselling Skills

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit distribution of the course			Eligibility Criteria	Pre-requisiteof the course (If any)
		Lecture	Tutorial	Practical /Practice		
Career Coaching and Applied Counselling Skills	**2**	**1**		**1**	**Nil**	**Nil**

The aim of career coaching is to help to understand what learners want, the skills needed and how it can be developed. A career coach supports the Individual in the initial steps of career advancement. It helps to shape individual skills for sustainable working life in future. Applied Counselling is an introduction to counselling to help effective counselling skills. It provides objective and useful guidance in personal and social scenarios for individuals or groups.

Learning Objectives:

- To understand Counselling and Career Coaching in various settings
- To impart skills in Career Coaching & Applied Counselling

Learning Outcomes:

- Enable with counselling skills, strategies & applications for various target groups
- Demonstrate a critical understanding of a range of definitions, theories, models, practicesand experiences in relation to coaching and mentoring
- Equipped with Mentorship & Career Coaching skills.

Course Outline

Unit 1: Introduction of Counselling and Career Coaching [Week 1-3]

1.1 Theories of Counseling – Psychoanalytic, Adlerian and Humanistic theories of Counseling

1.2 Counseling in a multicultural and diverse society

1.3 Understanding skills of Career Counseling and Career Coaching

1.4 Counseling vs Coaching

Unit 2: **Major Debate of Career Development, Choice, and Adjustment [Week 4-6]**

2.1 Understanding and Facilitating Career Development in the 21st Century

2.2 The Role of Diversity, Individual Differences, and Social Factors in Career Development, Choice, and Adjustment

3.3 Counselling, Developmental, and Preventive Interventions

3.4 Counseling & Life Skills Building – Negotiation Skills, Interpersonal Skills, Communication Skills

Unit: 3: Coaching and Mentorship [Week 6-8]

3.1 Core coaching and mentoring skills: listening, questioning and feeding back

3.2 Creating and managing a learning alliance between coach/mentor and coaches/mentee

3.3 Developing an individual approach to coaching and mentoring

3.4 Assessment and Occupational Information

Unit: 4: **Practicum and Field Intervention in Career Coaching and Applied Counselling Skills**

4.1 Techniques of Field Intervention in Counselling and Mentorship

4.2 Practicum with the allied Institutions

Suggested Readings

1. Gibson, R and Mitchell (2002) *Introduction to Counselling and Guidance*, Harrell prenticehall, (6th edition) , New Jersey.
2. Archer and McCarthy C.J (2008) *Theories of Counselling& Psychotherapy*, Merrill Prentice Hall, New Jersey.
3. Bee, F. and Bee, R. (2007) *Learning Evaluation*, CIPD Toolkit, 2nd edn, London, Chartered Institute of Personnel and Development.
4. Clutterbuck, D. (2008) 'What's happening in coaching and mentoring? And what is the difference between them?', *Development and Learning in Organizations: An International Journal*, vol. 22, no. 4, pp. 8–10
5. Passmore, J. (2007) 'Coaching and mentoring – the role of experience and sector knowledge', *International Journal of Evidence Based Coaching and Mentoring*, SpecialIssue 1, summer, pp. 10–16.
6. Whitmore, J. (2009) *Coaching for Performance: GROWing Human Potential and Purpose: The Principles and Practice of Coaching and Leadership*, People Skills forProfessionals, 4th edn, Nicholas Brealey Publishing, London.
7. Ulrich, D. (2008) 'Coaching for results', *Business Strategy Series*, vol. 9, no. 3, pp. 104–14. (This gives an introductory overview of the field of coaching and some coaching approaches.)

Teaching Learning Process:

The Teaching-Learning Process will incorporate innovative ways to engage Adult learners in twoways process. The lecture method along with participatory learning, demonstration method, Classroom Presentation and field exposure will be used.

Assessment Methods:

Class participation, Class exercises, Take-home assignments, Class assignments and field visit/short project-based internship report

Museum and Museology

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Museum and Museology	**2**	**1**	**0**	**1**		

Learning Objectives

The objective of this paper is to introduce and provide basic understanding about Museum and Museology as a discipline. Through this paper the students will be exposed to various aspects of museum history- (museum movement in India, particularly), its functioning, types and purpose. It will highlight the role of the museum as an important centre for preservation and dissemination of knowledge. This paper is of particular value to those who are seeking careers as curators, art collectors, researchers and conservators.

Learning outcomes

Upon completion of this course the student shall be able to:

- Understand museum as a resource center.
- Understand the historical process of institutionalization of archaeology and culture through museums.
- Develop an insight into the various roles of museum an organizer, preserver and manager of artifacts.
- And how museum is an effective center for dissemination of knowledge and information, and space for dialogue and interaction.
- Also develop some understanding about new museums.
- A student having studied this course will be skilled in culture and tourism based industries: possible employment includes tour guides, archaeology assistants, archivist, jobs in art galleries, museums, auction houses, researchers in NGOs

and other institutions, culture and art based writing and journalismand on social media

SYLLABUS :

Unit I **7 Weeks**

(i) Definition and meaning of Museum and Museology.

(ii) History of museums in India- Colonial to post independence.

Research based project (any two): History of- National Museum/ IndianMuseum/ Salar Jung Museum/Chhatrapati Shivaji Maharaj Vastu Sangrhalay

(iii) A brief introduction to New Museology

Unit II 7 Weeks

(i) Various functions of a museum- Collection, documentation (manual, digital and photographic), preventive conservation and exhibition.

(ii) Types of museums

Practical/Project: **Visit any one museum** to understand the nature and scope of its collection and exhibition techniques - National Museum/ Redfort Archaeological Museum/National Craft Museum and Hastkala Academy/ National Gallery of Modern Art/ National Science Centre /Gandhi Smriti Museum/Delhi Sulabh International Museum of Toilet/ Sanskriti Kendra (individual/ group assignments may be designed and assigned on one of these museums)

3-5 Days for Museum visit and field work.

Practical component (if any) – 50% practical component

Essential/recommended readings

Unit I:

This unit introduces students to the concept of Museum and Museology. With the help of International Council of Museum (ICOM) definitions - meaning, purpose and changing roles of museum can be understood. Unit will look into the history of colonial museums and their transformation into National Museums in the post-independence era. With the help of case studies of various national museums and their making, theirhistorical trajectory can be studied and understood in the background of the museum movement in India. Provide a brief introduction to the concept of new museology and how new museums became an agent of change in the Museum world.

- Burdhan, Anand (2017), Colonial Museum: An Inner History, Research IndiaPress, Delhi
- Choudhary, R. D. (1988). Museums of India and their Maladies. Calcutta: AgamPrakashan.
- Desvaltees, Andre, & Francas Mairesse Arrond Cown (2010), Key concept inMuseology ICOM-2010, Paris.

- Dwivedi, V P, Museums and Museology: New Horizons. Agam Kala Prakashan
- Guha-Thakurta, Tapati. (2004). Objects, Histories: Institution of Art in ColonialIndia, New York: Columbia University Press.
- Mathur, Saloni. (2007). India by Design: Colonial History and Cultural Display.Berkley: University of California
- Mathur, Saloni. (2000). "Living Ethnological Exhibits: The Case of 1886", Cultural Anthropology, Vol. 15 No. 4, pp 492-524
- सहाय, शिव स्वरूप (201 9). संग्रहालय की ओर , मोतीलाल बनारसीदास, नई ददल्ली
- Tiwari, Usha Rani and Pandey, Aarti. 2016. नव संग्रहालय ववज्ञान. Kala Prakashan
- Vergo, Peter, (1997)New Museology. Germany: Reaktion Books.

Unit II:

In this unit various functions of museum are to be studied. With the help of examplesand case studies, types of Museums and their features will be discussed. By studying the nature of the collection and the exhibition methods student shall be able to identify the museum types.

- Aggarwal, O. P. (2006). Essentials of Conservation and Museology, Delhi: Sundeep Prakashan.
- Agrawal, O.P. (Translation: Tiwari, R.P.) (2012) पुस्तकालय सामग्री और कला वस्तुओं का परीक्षण, Delhi.
- Dean, David and Gary, Edson (1994) Handbook for Museums, Routledge.
- Dwivedi, V P, Museums and Museology: New Horizons. Agam Kala Prakashan
- Jain, Sanjay (1999), म्यूज़ियम और म्यूज़ियोलॉजी एक परिचय, Kanika Prakashan, New Delhi
- Munsuri, Shahida. Museums, Museology and New Museology. India: Readworthy Press Corporation, 2018.
- Nair, S. N. (2011). Bio-Deterioration of Museum Materials, Calcutta: Agam Prakashan
- मुकुला, गिरीश चंद्र।, संग्रहालय ववज्ञान, मोतीलाल बनारसीदास

Suggestive readings

Museum:

- Ambrose Timothy , Paine Crispin (1993, 2006),Museum Basics, Routledge
- Burdhan, Anand (2017), Museological Pedagogy: Colonial Politics versus People's Museography, Research India Press
- Bedekar. V. H, New Museology, Museum Association of India, New Delhi
- Dwivedi, V P, Museums and Museology: New Horizons. Agam Kala Prakashan
- Macdonald, S. (Ed.). (2010). The politics of display: Museums, science, culture.Routledge.London

- Mathur, Saloni and Kavita Singh(reprint2020), no-touching, no spitting, no praying: The Museums in South Asia,Routledge.
- Roychowdhury, Madhuparna (2015). Displaying India's Heritage: Archaeologyand the Museum Movement in Colonial India, Orient Black Swan.
- Munsuri, Shahida. Museums, Museology and New Museology. India:Readworthy Press Corporation, 2018
- Macdonald, Sharon (2006), A companion to Museum Studies, Blackwell, UK andAustralia.
- Punja, Shobhita, (2014) Treasures: Salar Jung Museum, Hyderabad. Niyogi Books, Delhi.
- Punja Shobhita (2014) Treasure: Chhatrapati Shivaji Maharaj VastuSanghralaya, Mumbai, Niyogi Books, Delhi.

Examination scheme and mode:

Total Marks: 100 marks Internal
Assessment: 25 marks

End Semester University Exam: 75 marks

The Internal Assessment for the course may include Class participation, Assignments, Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

Note: Examination scheme and mode shall be as prescribed by the ExaminationBranch, University of Delhi, from time to time.

Reading the Archive

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title &Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Reading the Archive	**2**	**1**	**0**	**1**		

Learning Objectives

This course seeks to develop skills and methods of historical research through the critical evaluation of primary sources. The first unit of the course will emphasize that the historicalarchive cannot be treated as mere "information" and that issues of authorship, representation and access are crucial to any understanding of primary sources. At the coreof the course are three carefully designed basic research projects that will introduce students to a wide variety of primary sources that range from colonial ethnographic and legal texts to visual photographic archives. The student will focus on one kind of archive ineach project along with an important text that will illuminate the reading of this kind of archive by a historian.

Learning outcomes

- To expose students to a wide variety of archives used in historical work.
- To introduce students to scholarship that has critically and creatively used different kinds of primary sources.
- To develop skills to access, contextualize, and analyze primary sources and carry out research.
- A student having studied this course will be skilled in culture and tourism based industries: possible employment includes tour guides, archaeology assistants, archivist, jobs in art galleries, museums, auction houses, researchers in NGOs

and other institutions, culture and art based writing and journalismand on social media

SYLLABUS :

Unit 1: Introduction to Primary Sources: Power and Memory in the Archive
Unit 2: Projects

1) The documentary archive: colonialism and nationalism
2) Photography and the visual archive.
3) Gender, law and the archive

Practical component (if any) – 50% practical component

Essential/recommended readings

Unit 1: Introduction to Primary Sources: Power and Memory in the Archive (Teaching Time- 5 Weeks Approx.)

This unit will introduce the student to the notion of the archive as a cultural institutionproduced in contexts of power that allows both for the production, and elision of different kinds of historical narratives. It will also underline the issue of access, and digitization which is crucial to researchers today.

Students will be taken for a guided visit to either the National Archives of India or theDelhi State Archives.

Readings:

- Aparna Balachandran and Rochelle Pinto, Archive and Access, Bangalore, Centre for Internet and Society, 2011, 14-29, 50-81. https://cis-india.org/raw/histories-of-the-internet/blogs/archives-and-access
- Joan Schwartz, & Terry Cook, "Archives, Records, and Power: The Making of Modern Memory," Archival Science, Vol. 2, 1-19.

Unit 2: This unit is divided into 3 sections containing research projects that use different types of archives. (Teaching Time: 11 Weeks Approx.)

1) *The Documentary Archive: Colonialism and Nationalism:* In this section, the student can choose to do EITHER a project on a colonial text, or on a document produced in the course of the nationalist struggle in India. In the first case, students will understand the making of colonial knowledge; in the second, they will access the voices of peasants filtered through the accounts of the nationalist elite. Students can choose any section/chapter/ pages of the primary source in consultation with the teacher.
   a. *Primary source:* H.H. Risley and E.A Gait, Report on the Census of India, 1901; Secondary reading: Bernard Cohn, "The Census, Social Structure

and Objectification in India" in Anthropologist Amongst the Historians, Delhi: OUP, 1987, 224-254.

b. *Primary Source:* Shahid Amin, Tridip Suhrud and Megha Tod eds, ThumbPrinted: Champaran Indigo Peasants Speak to Gandhi, Navajivan Trust and National Archives of India, 2022.
Secondary Reading: Shahid Amin, Thumb Printed: Champaran Indigo Peasants Speak to Gandhi edited by Shahid Amin, Tridip Suhrud and Megha Tod, Navjivan Press and National Archives of India, Introduction,xiii-xxxvi.

2) In this section, the students can choose to either do a project on colonial- era photographs or on online personal photographic archives. In the first case, the student will be engaged with the idea of the camera as a technology of rule; in the second the focus will be on cultural memory and digitization. Students can choose any section/pages/chapter/s of the primary source in consultation with the teacher.

a. *Primary Source:* William Johnson, The Oriental Races and Tribes, Residents and Visitors of Bombay: A Series of Photographs with Letter Press Descriptions, London: W. J Johnson, 1863, https://archive.org/details/gri_33125008252070; Secondary Reading: Christopher Pinney, Camera Indica: The Social Life of Indian Photographs, London: Reaktion, 1997, Chapter 1: 'Stern Fidelity' and Penetrating Certainty.' 17-71.

b. *Primary Source:* The Indian Memory Project https://www.indianmemoryproject.com/
Secondary Reading: Katja Muller, "Between Lived and Archived Memory:How Digital Archives Can Tell History." Digithum, 19, 2017,1 1-18. https://redib.org/Record/oai_articulo1211444-between-lived-archived-memory-how-digital-archives-can-tell-history

3) In this section, students will reflect on historical archives are gendered in character through an analysis of a legal text on the Age of Consent controversy. The project will allow students see legal debates and law-making as masculine projects even as the legal archive allows us some access to the agency and voices of women. Students can choose any section/pages/chapter/s of the primary source in consultation with the teacher.

a. *Primary Source:* Age of Consent Act Report, Government of India, Calcutta, 1929.

b. *Secondary Reading:* Tanika Sarkar, "Rhetoric against Age of Consent: Resisting Colonial Reason and the Death of a Child-Wife," Economic andPolitical Weekly. 1993, Vol.28,

1869-1878.

Suggestive readings

- Anjali Arondekar "Without a Trace: Sexuality and the Colonial Archive." Journal

of the History of Sexuality, vol. 14, no. 1/2, 2005, 10–27.

- Antoinette Burton, ed., Archive Stories: Facts, Fictions, and the Writing of History (Durham: Duke University Press, 2005)
- Arlette Farge, The Allure of the Archives, New Haven: Yale University Press, 2013, 79-113.
- Crispin Bates, "Race, caste and tribe in central India: the early origins of Indian anthropometry" In Peter Robb (Ed.), The Concept of Race in South Asia, Delhi: OUP, 219-59.
- Edwards, Elizabeth. "Photography and the Material Performance of the Past."

History and Theory, vol. 48, no. 4, 2009, 130–50.

- Kama MacLean, "The Portrait's Journey: The Image, Social Communication and Martyr-Making in Colonial India." The Journal of Asian Studies 70, no. 4, 2011 1051–82.
- Ranajit Guha, "The Prose of Counter Insurgency", Subaltern Studies: Writings of

South Asian History and Society, Vol 2, Delhi: Oxford University Press, 1-42.

- Shahid Amin, "Gandhi as Mahatma: Gorakhpur District, Eastern UP, 1921-2' in

R. Guha (ed.), Subaltern Studies: Writings on South Asian History and Society,vol. 3, Delhi, Oxford University Press, 1984, 1-61.

- Tanika Sarkar "A Book of Her Own. A Life of Her Own: Autobiography of a

Nineteenth-Century Woman." History Workshop, no. 36, 1993, 35–65.

Examination scheme and mode:

Total Marks: 100
marks Internal
Assessment: 25
marks
End Semester University Exam: 75 marks
The Internal Assessment for the course may include Class participation, Assignments,Class tests, Projects, Field Work, Presentations, amongst others as decided by the faculty.

Note: Examination scheme and mode shall be as prescribed by the ExaminationBranch, University of Delhi, from time to time.

Logical Reasoning

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Logical Reasoning	**2**	**1**		**1**		

Learning Objectives

The Learning Objectives of this course are as follows:

- The course is designed to provide a grasp of the application of different types of broad logical reasoning skills
- It will develop the ability of students in reasoning in both deductive and experimental set ups
- Skilling students in problem solving ability

Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to explain the difference between deduction and induction
- After studying this course, students will be able to apply the experimental method
- After studying this course, students will be able to demonstrate the mental aptitude necessary to arrive at their conclusion from available data points

SYLLABUS:

UNIT 1: Introduction to Logical reasoning (6 weeks)

1. Square of Opposition
2. Converse, Obverse, Contraposition

Unit 2: Experimental Method in Logical Reasoning (8 weeks)

1 The Method of Agreement
2 The Method of Difference

3 The Joint Method of Agreement and Difference
4 The Method of Residues
5 The Method of Concomitant Variation

Practical/Exercises

All these methods will be explained through examples. Students will have to come up with examples from ordinary life as to how the methods developed are applicable to these circumstances.

Recommended Reading:
Copi, Irving M., Carl Cohen, and Kenneth McMahon. *Introduction to Logic*. 14th ed. Delhi: Pearson

Examination scheme and mode:

Total Marks:100
Internal Assessment: 25 marks
Practical Exam (Internal)
:25marks
End Semester University Exam:50 marks

The Internal Assessment
For the course may include Class participation, Assignments, Class tests, Projects, FieldWork, Presentations, amongst others as decided by the faculty.

Logical Skills for Professional Life

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Logical Skills for Professional Life	**2**	**1**		**1**	Class 12 Pass	None

Learning Objectives

The Learning Objectives of this course are as follows:

- The course is designed to provide necessary logical skills for professional life
- It also enables the student to know how to spot fallacies of reasoning
- It makes a student take steps to avoid fallacies of reasoning

Learning Outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to explain the difference between a good piece of reasoning and a bad piece of reasoning
- After studying this course, students will be able to discriminate poorly made but seemingly sound arguments
- After studying this course, students will be able to demonstrate the skill spotting fallacies in arguments made in common life

SYLLABUS :

UNIT I: INTRODUCTION (3 weeks)

1.1 Logic as the key to all learning

1) Arguments, Premises, and Conclusions
2) Recognizing Arguments
3) Deduction, Induction, and Abduction
4) Validity, Truth, Soundness

5) Argument Forms: Proving Invalidity

UNIT II: Logic: Formal and Informal (6 weeks)
3.1. Fallacies in General
3.2. Fallacies of Relevance
3.3. Fallacies of Ambiguity

4. Formal Logic: Categorical Propositions
4.1. The Components of Categorical Propositions
4.2. Quality, Quantity, and Distribution
4.3. Venn Diagrams and the Modern Square of Opposition
Categorical Syllogisms

UNIT III (6 weeks)

5.1. Analogical Reasoning
5.2. Legal Reasoning
5.3. Moral Reasoning
5.4. Statistical Reasoning
5.5. Hypothetical/Scientific Reasoning

Essential Readings

1. Hurley, Patrick J. (2015). *A concise introduction to logic.* Cengage Learning 12th Edition. (Selections are from this book, unless mentioned otherwise.)
1. Copi, Irving M.; Cohen, Carl; and McMohan, Kenneth. (Eds.). (2014). *Introduction to logic.*
Pearson 14th Edition.

Practical/Exercises

The various fallacies above will be discussed with contemporary examples from media, newspapers, books etc. Students will be encouraged to spot these fallacies themselves so that their critical faculties are improved and their skill in avoiding traps of bad reasoning are well developed.

Recommended Reading:

Copi, Irving M., Cohen, Carl, McMahon, Kenneth. *Introduction to Logic* Fourteenth Edition, Essex, Pearson Education Limited, 2014. (pp. 5 – 9 for Topic 1 & pp. 109 – 110 for Topic 2) for Unit 1

Copi, Irving M., Cohen, Carl, McMahon, Kenneth. *Introduction to Logic* Fourteenth Edition (pp 112 – 137), Essex, Pearson Education Limited, 2014. (Topics 1 -9) for Unit 2

Copi, Irving M., Cohen, Carl, McMahon, Kenneth. *Introduction to Logic* Fourteenth Edition (pp 138 – 151), Essex, Pearson Education Limited, 2014. (Topics 1 -8)

Examination scheme and mode:

Total Marks:100
Internal Assessment: 25 marks
Practical Exam (Internal)
:25marks
End Semester University Exam:50 marks

R Programming for Business Analytics

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
R Programming for Business Analytics	2	-	-	2	XII pass	Basic knowledge of computers

Learning Objectives

The objective is to introduce the basic concepts in R programming so as to equip the students with the popular statistical programming language R. The course will familiarize the students with utility of 'R' for managrial decision making.

Learning outcomes

Upon successful completion of this course the student will be able to:

- Learn Syntax and Semantics of R Programming
- Understand the file system and data handling in R.
- Visualize and analyse the data using statistical methods.
- Apply best practice model design methodologies to real problems using R

SYLLABUS

Unit I: Introduction to R, Data Handling and Data Visualization (4 Weeks) Introduction to R and familiarization of R Studio, Basic components in R Studio. R Syntax andprogramming , Understanding *tidyverse, tibble, dplyr, ggplot2, tidyr, purrr, readr, forcats, stringr* for tidying, manipulating and plotting data,

Unit II: Optimization Models using R (3 Weeks)

Linear Programming Models, Optimization models, understanding *optim(),*

Unit III : **Machine Learning with R - Introduction to Supervised Learning (4 weeks)** Classification based on similarities with k-nearest neighbours, odds with logistic regression, maximizing separation with discriminant analysis, classifying with decision tress, regression with kNN, random forest, XGBoost, Understanding *mlr, classif.* , regr. ,

Unit IV: Machine Learning with R - Introduction to Unsupervised Learning (4 weeks) Dimension Reduction- Maximizing variance with Principal Component Analysis; k-mean cluster, understanding *cluster*. .

Essential/recommended readings

- Boehmke, B. & Brandon, G.(2020). Handson Machine Learning with R, CRC Press.

- Horton, N.J. & Kleinman, K.(2015) Using R & R Studio for Data Management, StatisticalAnalysis , and Graphics, CRC Press.
- Peng, R. D. (2016). *R programming for data science* (pp. 86-181). Victoria, BC,Canada: Leanpub.
- Lander, J. P. (2014). *R for everyone: Advanced analytics and graphics*. Pearson Education.
- Teetor, P. (2011). *R cookbook: Proven recipes for data analysis, statistics, and graphics*. " O'Reilly Media, Inc.".
- Zhao, Y., & Cen, Y. (2013). *Data mining applications with R*. Academic Press.

Note: Learners are advised to use the latest edition of readings.

Examination scheme and mode:

Total Marks: 100
Internal Assessment: 25
marksPractical Exam
(Internal) 25marks
End Semester University Exam: 50 marks
The Internal Assessment for the course may include Class participation, Assignments,Class tests, Projects, Field-Work, Presentations, amongst others as decided by the faculty.

Articulation and Eloquence

Course title & Code	Total Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Articulation and Eloquence	**2**	1	1		0	**Class XII Pass**

Total Credits: 02

Learning Objectives:

(i) Learning correct and accurate pronunciation of Sanskrit phonemes.
(ii) Understanding the silent peculiarities of Sanskrit Articulation.
(iii) Practical Understanding of Sanskrit Eloquence.
(iv) Learning correct pronunciation and presentation of popular Sanskrit Mantras and Slokas.

Learning Outcomes:

(i) Student will be able to pronounce Sanskrit correctly effectively in all its peculiarities.
(ii) Students will be able to pronounce his mother's tongue in much more effective way.

SYLLABUS OF Articulation and Eloquence

Unit: I **Credit: 01**

(i) Importance of correct pronunciation.
(ii) Introduction to Sanskrit alphabets.
(iii) Places and efforts of pronunciation Sanskrit phonemes.
(iv) Attributes of Articulation.
(v) Blemishes of Articulation.
(vi) Regional errors in Sanskrit pronunciation.
(vii) Representation of Sanskrit in Roman scripts (Sanskrit Diacritical Marks).

Unit: II **Credit: 01**

(i) Definition of Eloquence. (मितं च सारं च वचो हि वाग्मिता।। नैषधीयचरितम् – 9/8), हितं मनोहारि च
दुर्लभं वचः।। किरातर्जुनीयम् – 1/ 4)
(ii) Importance of Eloquence.
(iii) Attributes of Eloquence. (महाभारत – शान्तिपर्व – 85.28), वाल्मीकि रामायण – किष्किन्धाकाण्ड- 4.3.28
-34), मनुस्मृति- 7.63-64), किरातार्जुनीयम् – 2.26 -28), अर्थशास्त्र- 2.10.10 – 2. 10.26).

(iv) Blemishes of Speech. (अर्थशास्त्र – 2.10.59 – 2.10.65).

[D] References:

1. रामायण – (1 -2 भाग), महर्षि वाल्मीकि , गीता प्रेस गोरख पुर , उत्तरप्रदेश,३४ वां पुनर्मुद्रण – सं० २०६५ ।
2. महाभारत- (1 -6 भाग), महर्षि वेदव्यास , अनुवादक, पं० रामनारायण दत्त शास्त्री, गीता प्रेस गोरखपुर , उत्तरप्रदेश, १३ वां
   सं० २०६७ ।
3. कौटिलीय अर्थशास्त्र- अनुवादक – उदयवीर शास्त्री, मेहरचन्द लछमन दास, दिल्ली- १९६८।
4. मनुस्मृति- (1-13 भाग), सं० एवं व्या० – डॉ० उर्मिल रुस्तगी, जे ० पी ० पब्लिशिंग हाउस, दिल्ली – २००५।
5. साहित्यदर्पण- (आचार्य विश्वनाथ), व्या० शालिग्राम शास्त्री, मोती लाल बनारसी दास, दिल्ली- १९७७।

Additional Resources:

1.वर्णोच्चारण- शिक्षा- (महर्षि पाणिनि), व्या ० श्री मद्दयानंद सरस्वती, रामलाल कपूर ट्रस्ट, बहाल गढ़, सोनीपत, हरयाणा-
   १९९५।
2. शिक्षा-शास्त्रम्- (महर्षि पाणिनि), व्या ० उदयनाचार्य , रामलाल कपूर ट्रस्ट, रेवली , मुरथल , सोनीपत, हरयाणा-
   २०१६
3. भाषा शास्त्र की भारतीय परम्परा एवं पाणिनि – रामदेव त्रिपाठी, बिहार राष्ट्र भाषा परिषद् , पटना ।
4. प्राचीन भारतीय वैय्याकरणों के ध्वनि शास्त्रीय विचार – सिद्धेश्वर वर्मा , हरयाणा हिंदी ग्रन्थ अकादमी।

[E] Weekly Plan:

Week 1 – Unit 1
Week 2 – Unit 1
Week 3 – Unit 2
Week 4 – Unit 2
Week 5 – Unit 2
Week 6 – Unit 2
Week 7 – Unit 2
Week 8 – Unit 2
Week 9 – Unit 2
Week 10 – Unit 2
Week 11 – Unit 2
Week 12 – Unit 2

[F] Teaching Learning prosess:

Reading, translation and explaning all Sutras/ Slokas withvarious examples. Power point Presentations, Quizzes etc.

[G] Assessment Methods:

I	**Final Examination** **Basic Structure of Question Paper & Division of Marks**	**38**

	(i)	Long Questions- 2 (from unit-1 to 2)	02 x 10 = 20
	(ii)	Short Questions-2 (from unit-2 to 2)	02 x 05 = 10
	(iii)	Short Notes-2 (Unit 2 to 2)	02 x 04 = 08
II		**Internal Assessment (Project/Discussion/Assignment/ paper presentation/ Periodic tests etc.)**	**12**
		Total Marks : (I+II)	**(38+12) = 50**

[H] Keywords:

(i) Articulation
(ii) Eloquence
(iii) Blemishes
(iv) Roman scripts
(v) Diacritical Marks

YOGA IN PRACTICE

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Yoga in Practice	**2**			2	0	**Class XII Pass**

Total Credits: 02

Learning Objectives:

Students will be able to discern real significance of yogic oprations from original sources and will be prone to practicing in their day to day life.

Learning Outcomes:

(i) Student will form an understanding of the concept of yoga.
(ii) Students will learn various aspets of the science of yoga.
(iii) Theoretical and practical knowledge of Aasanas and pranayams to lead a balanced life.

SYLLABUS OF YOGA IN PRACTICE

Unit: I

Credit: 01

(i) Definition and types of yoga:
Karma yoga, Gyana yoga, Bhakti yoga, Laya yoga, Raja yoga, Hatha yoga, Mantra yoga,
Kundalini yoga. (योग एवं स्वास्थ्य – अध्याय -१)

(ii) Ashtanga Yoga:
Yam- Ahinsa, Satya, Asteya, Brahmacharya, Aparigrah.
Niyam- Sauch,Santosha,Tapa, Swadhyaya, Ishwarpranidhana
Asan, Pranayam- (the types of Pranayaama: Puraka, rechak & Kumbhaka), Pratyahara,

Dharana, Dhyana & Samadhi etc.

(iii) Shat Chakra,s:

Mooladhara, Swadhishthana, Manipur, Anahata, Vishudha, Aagya, Sahasrara-(Sahasradhara chakra). (योग एवं स्वास्थ्य - अध्याय – २-३)

Unit: II **Credit: 01**

Asana,s and their advanteges:-

(i) Asana in standing position:

Surya Namaskara,Tadasana, Padahastasana, Garudasana, Natarajasana, Cakrasana.

(ii) Asana in sitting position:

Padmasana, Vajrasana, Siddhasana, Bhadrasana, Gomukhasana, Shashankasana, Mandukasana, Kukkutasana.

(iii) Asana in stomach side position:

Dhanurasana, Bhujangasana, Mayurasana, Marjarasana, Makrasana.

(iv) Asana in backbone side position:

Uttanapadasana, Naukasana,Sarvangasana, Sheershasana, Savasana etc.

(v) Practice of pranayama- Purak, Rechak and Kumbhaka. (योग एवं स्वास्थ्य - अध्याय – ३ -४,६)

[D] References:

1. योग दर्शन – महर्षि पतंजलि, टीकाकार-हरिकृष्णदास गोयन्दका, गीता प्रेस, गोरखपुर, उत्तर प्रदेश, ४० वां पुनर्मुद्रण।

2. योग एवं स्वास्थ्य – डॉ० विजय कुमार, चौखम्भा विश्वभारती, वाराणसी, उत्तर प्रदेश, प्र ० संस्करण – २०२१।

3. प्राणायाम रहस्य –(वैज्ञानिक तथ्यों के साथ)– स्वामी रामदेव, दिव्य प्रकाशन, दिव्य योग मन्दिर ट्रस्ट, पतंजलि योगपीठ ,

कनखल, हरिद्वार।

4. योग साधना एवं योग चिकित्सा रहस्य- स्वामी रामदेव, दिव्य प्रकाशन, दिव्य योग मन्दिर ट्रस्ट, पतंजलि योगपीठ ,

कनखल, हरिद्वार।

5. शतयुर्वै पुरुषः – स्वामी रामेश्वरानान्द सरस्वती, आर्ष प्रकाशन, कुंडेवालान, दिल्ली-सं० २०६२। (ई– वैदिक पुस्तकालय, मुम्बई)

Additional Resources:

1. योग थिरपी – स्वामी अद्वैतानन्द सरस्वती, गुरुकुल वृन्दावन स्नातक शोध संस्थान, आसफ अली रोड, नई दिल्ली -२००६।

2. व्यायाम का महत्त्व – स्वामी ओमानन्द सरस्वती, हरयाणा साहित्य संस्थान, गुरुकुल झज्जर, हरयाणा -२००६।

3. आयुर्वेदीय पञ्चकर्म चिकित्सा- आचार्य विद्याधर शुक्ल, भारतीय केन्द्रीय चिकित्सा परिषद्, नई दिल्ली।
4. रोग और योग- स्वामी कर्मानन्द सरस्वती, योग पब्लिकेशन, मुंगेर , बिहार , संस्करण- २०१३।
5. सम्पूर्ण योग विद्या - राजीव जैन त्रिलोक, मंजुल पब्लिशिंग हाउस, भोपाल, मध्य प्रदेश, संस्करण -२००५।

[E] Weekly plan:

Week 1 – Unit 1
Week 2 – Unit 1
Week 3 – Unit 2
Week 4 – Unit 2
Week 5 – Unit 2
Week 6 – Unit 2
Week 7 – Unit 2
Week 8 – Unit 2
Week 9 – Unit 2
Week 10 – Unit 2
Week 11 – Unit 2
Week 12 – Unit 2

[F] Teaching Learning prosess:

Reading, translation and explaning all Sutras/ Slokas withvarious examples.
Power point Presentations, Quizzes etc.

[G] Assessment Methods:

I		**Final Examination** **Basic Structure of Question Paper & Division of Marks**		**38**
	(i)	Long Questions- 2 (from unit-1 to 2)	02 x 10	= 20
	(ii)	Short Questions-2 (from unit-2 to 2)	02 x 05	= 10
	(iii)	Short Notes-2 (Unit 2 to 2)	02 x 04	= 08
II		**Internal Assessment (Project/Discussion/Assignment/ paper presentation/ Periodic tests etc.)**		**12**
		Total Marks : (I+II)		**(38+12) = 50**

[H] Keywords:

(i) Yoga
(ii) Aasana
(iii) Pranayama
(iv) Kshatchakara
(v) Samadhi

Floriculture

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Floriculture	**2**	**0**		**2**	Nil	Nil

Learning Objectives

- To acquaint students with the basic principles and importance of Floriculture.
- To teach students about flowering plants that can be grown in different seasons in Delhi-NCR.
- To make students aware about exotic flowering plants of ornamental value and their propagation in laboratories and greenhouses.
- To provide information about employment, business opportunities and other avenues in the Floriculture sector (Floriculturist).

Learning outcomes

After completion of this course learners will be able to:

- identify and describe the ornamental flowering plants in Delhi-NCR.
- practice the methods of preparing soil and water, cultivation and propagation methods.
- design, prepare and apply appropriate combinations of plants and methods of cultivation for commercial setup.
- adapt to the job role of Floriculturist (employment/ entrepreneurship)

SYLLABUS

Practicals:

1. Introduction to floriculture, tools and equipments. 01 Week
2. Study of diversity in shape, size, and colour of flowers (including basic botany, nomenclature, common name and general uses). 01 Week
3. Identification and preparation of an inventory of herbaceous flowering plants, climbers, shrubs, and trees around the campus. 01 Week
4. Study the various physico-chemical soil properties for understanding different soils/soil-types. 02 Weeks
5. Methods of preparation of floral beds, soil preparation, greenhouse design and fumigation methods. 02 Weeks
6. Methods of seed sowing and raising flowering plants through seeds, bulbs and through vegetative methods in planters, containers and in outdoor environments. Role of light, plant growth regulators and nutrients in blooming and flowering. 02 Weeks

7. Bacterial and fungal diseases and pests of ornamental flowers and their management. 01 Week
8. Interior decoration methods, flower arrangements (Japanese, Western and Indian). 01 Week
9. Harvesting, methods to increase the shelf life of flowers, post-harvest care and marketing platforms for the floriculture industry. 02 Weeks
10. Field visit to nearby nursery/garden to understand basic aspects of Garden design. 01 Week
11. Project Report on any five flowering plants that are grown commercially, their share in the global market, methods used for selling the products and importance of the floriculture industry in job creation. 01 Week

Suggested Readings:

1. Randhawa, G.S., Mukhopadhyay, A. (1986). Floriculture in India. New York, NY: Allied Publishers.
2. Larson, R. A. (Ed.). (2012). Introduction to floriculture. Elsevier.

Additional Resources:

1. Pal, S. L. (2019). Role of plant growth regulators in floriculture: An overview. J. Pharmacogn. Phytochem, 8, 789-796.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch

Mushroom Culture and Technology I

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Mushroom Culture and Technology I	**2**	**0**		**2**	Nil	Nil

Learning objectives

To make students aware about

- mushroom growing techniques.
- medicinal and nutritional value of mushrooms.

Learning Outcomes

After successful completion of the course, students will be able to:

- practice the techniques for cultivation of various edible mushrooms
- setup entrepreneurial small scale units for self-employment
- apply the skills as Mushroom Grower in large scale industries.

SYLLABUS

Practicals:**

** Specimens and examples studied may vary depending on seasonal factors and availability

1. To study the principle and operation of Autoclave, Incubator, Laminar Air Flow/ BSL 2 facility. 01 Week
2. To study edible mushrooms (*Agaricus, Pleurotus, Boletus, Lentinula, Calocybe, Volvariella, Morchella*). 01 Week
3. To study poisonous mushrooms *(Amanita, Cortinarius, Psilocybe, Coprinopsis*). 01 Week
4. To study medicinal mushrooms (*Ganoderma, Ophiocordyceps, Chaga, Hericium*). 01 Week

5. Preparation of various types of compost and media which can be used for cultivation of mushroom. 01 Week
6. To study the common fungal, bacterial, viral, and insect borne diseases of mushrooms (any 2 from each). 01 Week
7. To study the cultivation technique of *Agaricus* mushroom. 01 Week
8. To study the cultivation technique of *Pleurotus* mushroom. 01 Week
9. To study the cultivation technique of *Calocybe/ Volvariella* mushroom. 01 Week
10. To study the cultivation technique of *Ganoderma* mushroom. 01 Week
11. To study the nutritional value and market value of mushrooms, and post-harvest technologies like packaging and preservation. 01 Week
12. Various requirements for setting up a mushroom cultivation unit ("kuccha" or cemented house). 01 Week
13. Entrepreneurship in cultivation of mushrooms. 01 Week
14. Government policies related to the promotion of mushroom cultivation. 01 Week
15. Visit to an Institute or Center conducting mushroom cultivation (Report to be submitted). 01 Week

Suggested Readings:

1. Bahl, N. (2015). Hand Book on Mushroom. Page no. 1-166. Oxford &IBH Publishing Company.
2. Russell, S. (2014). The Essential Guide To Cultivating Mushroom. Storey Publishing. North Adams, M.A. 01247.
3. Zied, D. C., Gimenez, A. P. (017) Edible and Medicinal Mushroom page no. 1- 585.John Wiley & Sons Ltd.UK.
4. Chang, S.T., Miles, P.G. (2004) Mushrooms Cultivation, Nutritional Value, Medicinal effect and Environmental Impact, CRC Press.
5. Fletcher, J.T., Gaze, R.H. (2007). Mushroom Pest and Disease Control. CRC Press.
6. Ahlawat, O.P., Tewari , R.P. (2007) .Cultivation Technology Of Paddy Straw Mushroom (*Volvariella volvacea*). Pages 1-44 National Research Center for Mushroom (Indian Council of Agricultural Research) Chambaghat, Solan (HP).
7. Rai, R.D., Arumuganathan, Y. (2008). Post Harvest Technology of Mushrooms. National Research Center for Mushroom (Indian Council of Agricultural Research) Chambaghat, Solan (HP)
8. Singh, M., Vijay, B., Kamal, S., Wakchaure, G.C. (2011) . Mushrooms Cultivation, Marketing and Consumption., Publishers Directorate of Mushroom Research (ICAR) Chambaghat, Solan.

Note: **Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**

Hydroponic and Aeroponic Farming

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Hydroponic and Aeroponic Farming	**2**	**0**		**2**	Nil	Nil

Learning objectives:

- The objective of the course is to provide hands-on experience to students on various aspects of hydroponics and aeroponics.
- To make students self-reliant and employable by providing the necessary knowledge and experience to establish hydroponic and aeroponic systems.

Learning Outcomes:

After completing the course, learners will be able to:

- develop basic hydroponics and aeroponics facilities at any given location (pilot scale and/or industrial scale).
- devise and implement a strategy for marketing of the product.
- apply the knowledge to fulfill certification rules and various government policies.
- establish themselves as entrepreneurs (Hydroponic cultivator).

Practicals:

1. Study of techniques used in hydroponics (Circulating methods such as Nutrient Film Technique (NFT), Deep Flow Technique (DFT), Dutch bucket; Non circulating methods such as Root dipping, Floating, Capillary action; Aeroponics such as root mist and fog feed techniques). 02 Weeks
2. Study of various instruments used in hydroponics (Pressure gauge, Filters, PVC Tanks, Venturi/Reciprocating Pump/Mixing tank, EC meter, pH meter, TDS meter, water pump, net cups, air pump, thermometer, lux meter, drip irrigation system. 02 Weeks
3. Construction of sustainable hydroponic and aeroponic units (including greenhouse facilities) 02 Weeks
4. Preparation of growth media for Hydroponics. 01 Week
5. Estimation of NPK, DO, TDS, pH of growth media. 01 Weeks

6. Study of suitable conditions for Hydroponics-quality, light intensity, photoperiod and temperature. 01 Week
7. Growing a leafy vegetable/fruity vegetable/medicinal herb /aromatic plant in Hydroponics /Aeroponic solution. 04 Weeks
8. Study of safety measures, certification standards and government policies. 01 Week
9. Visit to Hydroponic/Aquaculture/Aeroponic farm/Institute. 01 Week

Suggested Readings:

1. Meier Schwarz. (1995). Soilless Culture Management. Advanced Series in Agricultural Sciences, vol 24.Springer, Berlin.

2. Hasan, M.; Sabir, N.; Singh, A.K.; Singh, M.C.; Patel, N.; Khanna, M.; Rai, T.; and Pragnya, P. (2018). Hydroponics Technology for Horticultural Crops, Tech. Bull. TB-ICN 188/2018.Publ. by I.A.R.I., New Delhi.

3. Misra, R.L., Misra S. (2017). Soilless Crop production. Daya Publishing House, Astral

Additional Resources:

1. Goddek, S., Joyce, A., Kotzen, B., Burnell, G.M. (2019). Aquaponics Food Production Systems.Springer, Cham.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

Viewing and Capturing Diversity in Nature

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Viewing and Capturing Diversity in Nature	**2**	**0**		**2**	Nil	Nil

Learning objectives

- Understand fundamentals of digital cameras and smartphone photography technology.
- Develop a working knowledge of digital image analysis and processing.
- Understand the importance and use of Nature photography in business and as career goal.
- Enhance appreciation for the tremendous aesthetics inherent in nature.

Learning Outcomes

On successful completion of this course, a student will be able to:

- Describe and use the digital camera and smartphone camera functions and their applications
- employ different photographic equipment to enhance their photographic skills and create digital resources.
- discriminate between the photographic variables with reference to weather and season.
- employ the photographic skills in various professions and for entrepreneurship.

Practicals:

1. To study the parts of a digital camera. 01 Week
2. To study the principle and working of digital camera/ smartphone camera. 01 Week
3. Working and handling of light microscopes (Dissection and Compound). 01 Week

4. Study of plant forms through microscopic lens (Single-celled, colonial forms, filamentous forms, multicellular and complex forms).
   02 Weeks
5. To study techniques of capturing shots (using light and lenses effectively, macro and micro photography, wide angle and close-ups). 01 Week
6. Study of plant adaptations through photographs (Aquatic and desert plants). 01 Week
7. To capture and understand the Ecological Interactions. 02 Weeks
8. Identification of different plant life forms through online available tools/ search engines. 02 Weeks
9. Outdoor/ Campus Photography: Plants, Environment, Landscapes and Cityscape. 01 Week
10. Foldscope: The domestic microscope. Use the Foldscope to explore microscopic organisms in pond water. 01 Week
11. Project Work: To make a portfolio of diverse landscaping patterns/ selected themes through outdoor visits. 02 Weeks

Suggested Readings:

1. Ang., T. (2008). Fundamentals of modern Photography. London, Mitchell.
2. Freeman Patterson "The Art of Seeing" by Key Porter Books.
3. Tim Fitzharris "Landscape Photography" Firefly Books.
4. Kelby, S. (2012). The digital photography book. Peachpit Press.
5. Langford, M., Fox, A., and Smith, R.S. (2013). Langford basic photography:the guide for serious photographers. Amsterdam: Focal Press/Elsevier.
6. Peterson, B. (2016). Understanding exposure: how to shoot great photographs with any camera. AmPhoto Books.

Additional Resources:

1. Sharma P.D. (2008) Ecology and Environment. Rastogi Publishers.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

Plant Aromatics and Perfumery

CREDITDISTRIBUTION, ELIGIBILITY AND PRE-REQUISITESOFTHECOURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Plant Aromatics and Perfumery	**2**	**0**		**2**	Nil	Nil

Learning objectives

- Provide the basic understanding of aromatic and medicinal plants including classification and methods of extracting essential oils.
- Practical demonstration of extraction and quality assessment of the product obtained.

Learning Outcomes

After completion of the course, learners will be able to:

- extract essential oils from a variety of plants and plant parts.
- develop strategy for promotion and marketing of the aromatic and essential oils.
- establish their own startup, become self-reliant and/or adapt to job roles in beauty and wellness sector.

Practicals:

1. Classification of essential oils on the basis of chemical composition, aroma and extraction methods.
   01 Week
2. Principles, processing and techniques of extraction of essential oils. 01 Week
3. Cultivation practices of the common aromatic crops (any five) - Rose, Lavender, Peppermint, Spearmint, Basil, Citronella, Vetiver, Palmrosa, Lemongrass. 02 Weeks

4. Extraction process of essential oil from fruit/ fruit peel by steam distillation (e.g. orange, lemon). 01 Week
5. Extraction of essential oil from bark by steam distillation (e.g. cinnamon). 01 Week
6. Extraction of essential oils from flower by steam distillation (e.g. clove, rose, jasmine, lavender, rosemary). 01 Week
7. Extraction of essential oil from leaves and stems by steam distillation (e.g. lemongrass, eucalyptus, citronella, bottlebrush). 01 Week
8. Extraction of essential oil from seeds by steam distillation (e.g. fennel, nutmeg).01 Week
9. Extraction of essential oil from root (e.g. vetiver) and rhizome (e.g. ginger, curcuma)by steam distillation 01 Week
10. Determination of oil content in aromatic crop/material by Clevenger's method. 01 Week
11. Quality assessment of essential oils through s*ensory evaluation* (odour, colour), physical tests (specific gravity, refractive index, optical rotation, solubility), chemical tests (determination of acid value, ester value). 02 Weeks
12. Demonstration/Illustration of Instruments and techniques quality assessment of Gas chromatography (GC) and Thin layer chromatography (TLC). 01 Week
13. Field Visit to essential oils and perfumery Institute/Industry. 01 Week

Suggested Readings:

1. EIRI BOARD. (2008). Handbook of Essential Oils Manufacturing and Aromatic Plants5/E edition, Engineers India Research Institute (India), New Delhi.
2. Kochhar, S.L. (2016). Economic Botany – A Comprehensive Study, 5th Edition. New Delhi, India: Cambridge University Press.

Additional Resources:

1. Başer, K.H.C., Buchbauer, G. (2020). Handbook of Essential Oils: Science, Technology, and Applications, 3rd edition, CRC Press.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

Nursery, Gardening and Landscaping

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Nursery, Gardening and Landscaping	**2**	**0**		**2**	Nil	Nil

Learning objectives

The program is aimed to teach students the basic knowledge required to develop entrepreneurship skills in the development of Nursery, Gardening and Landscaping. This course would train students to initiate a remunerative enterprise owing to a high demand of skilled professionals in this field.

Learning Outcomes

After completing this course, the learners will be able to:

- describe and differentiate between the types of gardens.
- practice different methods for propagation of plants.
- execute several nursery and gardening operations.
- assess growing conditions of different horticultural plants, their general requirements and understand their role in landscaping.

Practicals:

1. Methods of preparation of nursery beds and sowing of seeds. Media for propagation of plants in Nursery Beds, Pots and Mist chamber. 03 Weeks
2. Study and practice of different propagation methods *viz*., cutting, layering, division, grafting and budding. 01 Week
3. Introduction and practicing Bonsai training, pruning and wiring. 01 Week

4. Study of different types of gardens (indoor and outdoor) and key features of gardens (Paths & Avenues, Hedges & Edges, Lawn, Flowerbeds, Arches & Pergolas, Fencing, Water bodies, Rock garden). 02 Weeks
5. Methods for selection and enlisting of suitable plants for different locations and in different types of gardens. 01 Week
6. Identification of key horticultural plants, Herbs including different types of grasses – foliage and flowering, Shrubs including hedge plants - foliage and flowering, Avenue trees – foliage and flowering, Climbers, Lianas, Epiphytes, Creepers, Trailers, Aquatic plants, Succulents, Weeds. 02 Weeks
7. Study of important gardens of India (any five). 01 Week
8. Methods of Landscape designing of Residential areas and Public Gardens, Aquatic Garden, Rock Garden, Industrial gardens. 01 Week
9. Concept and Application of Computer aided Designing (CAD) for landscape designing/ Preparation of landscape designs for school and college using CAD technology. 02 Weeks
10. Demonstration of different composting methods for Biofertilizers. 01 Week

Suggested Readings:

1. A handbook of Landscape: CPWD
2. Gopalaswamiengar, K. S., Parthasarathy, G., Mukundan, P. (1991). Complete Gardening in India. India: Gopalaswamy Parthasarathy, 'Srinivasa'.
3. Hartmann, H. T., Kester, D. E., Hartmann, H. T., Kester, D. E. (1975). Plant Propagation: Principles and Practices. India: Prentice-Hall.
4. Roy, R. K., Roy, R. K. (2013). Fundamentals of Garden Designing: A Colour Encyclopedia. India: New India Publishing Agency.
5. Littlepage, R., Littlepage, R. (2017). Fundamentals of Garden Design: An Introduction to Landscape Design. (n.p.): CreateSpace Independent Publishing Platform.

Additional Resources:

1. Hodge, G., Hodge, G. (2014). Practical Botany for Gardeners: Over 3,000 Botanical Terms Explained and Explored. United Kingdom: University of Chicago Press.
2. The Royal Horticultural Society Gardening Manual. (2000). United Kingdom: Dorling Kindersley.

Note: **Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**

Horticulture

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Horticulture	**2**	**0**		**2**	Nil	Nil

Learning objectives

- To acquaint students with the basic, principles, concepts and importance of Horticulture
- To train students in lawn designing, species selection for lawns, parks, home gardens and terrace gardens.
- To provide information about the employment and business opportunities and other avenues in the horticulture sector

Learning Outcomes

After completion of the course, learners will be able to:

- design gardens and learn the art of landscape design.
- describe and implement methods of preparing soil, cultivation and propagation for growing hedges, climbers, vegetables, and fruit yielding plants
- create and maintain nurseries, green houses and implement innovative practices in maintenance, harvesting and storage of horticultural produce.
- apply the skills for enhancing the job opportunities (Horticulturist) as well as self-employment.

Practicals:

1. Introduction to Horticulture; Garden tools and safety. 01 Week
2. Lawn making and lawn care: recognizing soils and drainage systems, types of grasses. 01 Week
3. Choosing the appropriate plants (species selection) for plantation in different seasons and locations (Outdoor, roof-top, balcony, rock gardens); Flowering annuals, herbaceous

perennials, vines and climbers, ornamental trees, bulbous and foliage plants, cacti and succulents. 01 Week

4. Vegetable Garden: Sowing, raising seedlings, transplantation methods; choosing the right vegetables for the season. 01 Week
5. Seed germination, viability tests and comparison of other parameters of seeds (stored from different years/different temperatures). 01 Week
6. Weeding, manuring, and irrigation methods used in lawns, parks, and vegetable gardens. 01 Week
7. Propagation and plant care: propagation by layering, cutting and other methods. 01 Week
8. Pruning: pruning roses, shrubs, and trees. 01 Week
9. Supporting plants: bamboos, strings, and enclosures. 01 Week
10. Maintenance and care of lawns and gardens: understanding diseases caused by pests and pathogens; protecting garden plants from infections, treating the plants with organic and biopesticides. 01 Week
11. Bonsais: Art and craft. 01 Week
12. One week internship on field or in a company/organisation (Landscape Design) that shall be facilitated by the college and report to be submitted. 02 Week
13. Methods and plantation approaches in various garden designs: Japanese, Mughal, Buddhist, English and Indian Gardens. 01 Week
14. Enhancing beauty of a garden using flowering plants, Garden walls, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Borders, aquatic garden with flowers; Case studies: Some selected gardens of India. 01 Week

Suggested Readings:

1. Edmondson, J.L., Cunningham, H., Densley Tingley, D.O. et al. (2020). The hidden potential of urban horticulture. Nat Food **1,** 155–159.
2. Musser E., Andres. (2005). Fundamentals of Horticulture. New Delhi, Delhi: McGraw Hill Book Co. 2.
3. Sandhu, M.K. (1989). Plant Propagation. Madras, Bangalore: Wile Eastern Ltd.
4. Bird, C. (Ed.). (2014). The fundamentals of horticulture: Theory and practice. Cambridge University Press.
5. The Practical Gardener (1994). Reader's Digest Special Volume.

Note: Examination scheme and mode shall be as prescribed by the Examination

Branch, University of Delhi, from time to time.

Mushroom Culture and Technology-II

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Mushroom Culture and Technology-II	**2**	**0**		**2**	Nil	Nil

Cultivation of Button mushroom and King oyster mushroom

Prerequisites:

Compost preparation for button mushroom would start around October-November and further cultivation steps will take place from January. Compost and spawn should be prepared before going to the next step.

Learning objectives:

- To develop skills for growing button and king oyster mushroom

Learning Outcomes:

After completion of this course, the learner will be able to:

- prepare casing soil and apply over spawn-run compost bags.
- implement harvesting, packaging and marketing of produce as per FSSAI standards.

Practicals:**

** Specimens and examples studied may vary depending on seasonal factors and availability

1. To add and mix spawn of button mushroom to pre-prepared compost (Spawning). 01 Week
2. To set up ideal mushroom house for cultivation of button mushroom. 02 Weeks
3. To maintain ideal environmental conditions for spawn run. 01 Week
4. Preparation and sterilization of casing soil. 01 Week
5. To apply casing soil over the spawn run compost bags and incubating for case run. 01 Week

6. To maintain appropriate conditions for pin head formation and fruiting of button mushroom. 02 Weeks
7. Harvesting of first flush of button mushrooms. 01 Week
8. Post-harvest packaging and storage of button mushrooms. 01 Week
9. Maintaining the environmental conditions for the second flush of button mushroom. 01 Week
10. To prepare and sterilize substrate bags for cultivation of king oyster mushroom. 01 Week
11. To add the spawn of king oyster mushroom in the substrate bags under aseptic conditions and incubator under appropriate conditions. 01 Week
12. To induce fruiting of king oyster mushroom by scraping the mycelium from the edges and surface of spawn run bags. 01 Week
13. Harvesting, post-harvest packaging and storage of king oyster mushrooms. 01 Week

Suggested Readings:

1. Aggarwal, A., Sharma, Y.P., Angra, E. (2021). A textbook on mushroom cultivation, Theory and Practices. Newrays Publishing House, 2021.
2. Tiwari, S.C. Kapoor, P. (2018). Mushroom Cultivation. Mittal Publications. ISBN - 978-8183249232.
3. Bahl, N. (2015). Hand Book on Mushroom. Page no. 1-166. Oxford &IBH Publishing Company. ISBN- 13:978-8120413993.
4. Russell, S. (2014). The Essential Guide To Cultivating Mushroom. Storey Publishing. North Adams, MA 01247 page no. 1-233. ISBN 978-1-61212-146-8.
5. Chang, S.T. Miles, P.G. (2004). Mushrooms Cultivation, Nutritional Value, Medicinal effect and Environmental Impact. Page no. 1-477, CRC Press.
6. Fletcher, J.T., Gaze, R.G. (2007). Mushroom Pest and Disease Control. CRC Press.
7. Rai, R.D., Arumuganathan, Y. (2008). Post harvest technology of mushrooms. Pages 1-72. National Research Center for Mushroom (Indian Council of Agricultural Research) Chambaghat, Solan-173 213 (HP)

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

Biofertilizers

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Biofertilizers	**2**	**0**		**2**	Nil	Nil

Learning objectives:

To help the students understand:

- the concept of biofertilizers and develop the skills for handling microbial inoculants.
- the growth and multiplication conditions of useful microbes and their role in mineral cycling and nutrition to plants.
- various methods of decomposition of biodegradable waste and their conversion to compost.

Learning outcomes:

After completion of this course, the learners will be able to:

- describe the different methods of composting.
- assess quality of compost and its role in soil nutrition.
- apply methods of bio-control
- develop a composting unit for production of biofertilizers (generate employment)

Practicals:

1. Introduction to rhizobial symbiosis - Study of *Rhizobium* and its isolation from root nodules of leguminous plants by Gram staining method. 01 Week
2. Study of different bio-composting methods (microbes and earthworm). 02 Weeks
3. Compost quality assessment and its role in soil nutrition - Test for pH, NO^{3-}, $SO4^{2-}$, Cl^{-} and organic matter of different composts. 02 Weeks
4. Introduction to Arbuscular mycorrhiza - Study of arbuscular mycorrhizal fungi from plant roots by staining methods. 01 Week
5. Isolation of arbuscular mycorrhizal spores from rhizosphere soil. 01 Week

6. Study structure of *Anabaena and Azolla* structure - Isolation of *Anabaena* from *Azolla* leaf. 01 Week
7. Study various biocontrol methods and their application Pheromone trap, *Trichoderma*, *Pseudomonas*, Neem etc. 01 Week
8. Projects on any one of the following topics: *Rhizobium* technology, AMF technology, Organic farming, Bio composting, Vermicomposting, *Azolla* culture etc. The design of the project should be such that it includes a continuous work of at least 6 weeks and a dissertation submission/ presentation/ CE - continuous evaluation. 06 Weeks

Suggested Readings:

1. Kumaresan, V. (2005). *Biotechnology.* New Delhi, Delhi: Saras Publication.
2. Sathe, T.V. (2004). *Vermiculture and Organic Farming.* New Delhi, Delhi: Daya publishers.
3. Subha Rao, N.S. (2000). *Soil Microbiology.* New Delhi, Delhi: Oxford & IBH Publishers.
4. Khosla, R. (2017). Biofertilizers and Biocontrol Agents for Organic Farming Kojo Press.

Additional Resources:

1. Azotobacter - Isolation and characterization -- https://youtu.be/1Z1VhgJ2h6U
2. Rhizobium -- Identification and characterization - https://youtu.be/jELlo-pMvc4.
3. 3-Days Online Workshop On Arbuscular Mycorrhizal Fungi_ Biodiversity, Taxonomy and Propagation 19-2 (2022-01-20 at 02_27 GMT-8) – https://youtu.be/LKzK4IuSRc4
4. Vayas,S.C, Vayas, S., Modi, H.A. (1998). Bio-fertilizers and organic Farming. Nadiad, Gujarat: Akta Prakashan.

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Organic Farming

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Organic Farming	**2**	**0**		**2**	Nil	Nil

Learning objectives:

- To create awareness among the students about organic farming and its importance in sustainable agriculture.
- To provide a skill set of Organic farming to students to help them become self-reliant.

Learning Outcomes:

After completion of this course the learners will be able to:

- practice organic farming along with application of indigenous knowledge.
- establish entrepreneurial ventures and generate employment (Organic Grower).
- evaluate the organic produce as per FSSAI standards (Government rules).

Practicals:

1. Study of Organic Farming as an integrated approach. 01 Week
2. Soil analysis-physical testing and assessment of soil types, weighment, water movement, soil conditioners, etc. 02 Weeks
3. Manure preparation and introduction to compost, composting and its value addition quality test. 01 Week
4. Study of Indigenous Technology Knowledge (ITK) for nutrient, insect, pest disease and weed management. 02 Weeks
5. Study of various agriculturally useful Biofertilizers. 01 Week
6. Biocontrol agents including Integrated Pest Management. 01 Week
7. Study of traditional organic input preparation/formulation of Biofertilizer, biopesticides, plant health promoters like *Panchgavya, Beejamrut* etc. 02 Weeks
8. Study of the system of organic certification and inspection. 01 Week

9. Branding of rural products, FSSAI, marketing, packaging and handling of organic produce. 01 Week
10. Current Government schemes related to organic farming. 01 Week
11. Visit organic farms to study the various components and their utilization. 02 Weeks

Suggested Readings:

1. Dhama, A.K. (2014). Organic Farming for Sustainable Agriculture (2nd edition), Agrobios (India), Jodhpur.
2. Sharma, Arun K. (2013). A Handbook of Organic Farming, Agrobios (India), Jodhpur
3. Palaniappan, S.P. and Anandurai, K. (1999). Organic Farming – Theory and Practice. Scientific Pub. Jodhpur
4. Thapa, U and Tripathy, P. (2006). Organic Farming in India, Problems and prospects, Agritech, Publising Academy, Udaipur.
5. Jaivik Kheti Sahayak Pustika- National Centre for Organic and Natural Farming, Department of Agriculture & Farmers Welfare, GoI.

Additional Resources:

1. National Program for Organic Production-APEDA, Ministry of Commerce & Industry, GoI.

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SEC–11: Green Belt Development for Smart Cities

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credits	Credit Distribution Of The Course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Green Belt Development for Smart Cities	**2**	**0**		**2**	Nil	Nil

Learning objectives:

- To introduce students with one of the key green skill development programs under the Skill India mission by the Government of India.
- To acquaint students with various methods and techniques used in development of green infrastructure for smart cities

Learning Outcomes:

After completion of the course, students will be able to:

- measure factors (biotic and abiotic) contributing to sustainable, healthy environment.
- Assess, describe and use the appropriate plants for restoring polluted environment.
- use their skills enhancing for green infrastructure development (UN-SDG).

Practicals:

1. Methods of vegetation sampling and calculation of importance value index 01 Week
2. Measuring Tree Basal Area, Height and Canopy Cover to estimate green cover of an area. 02 Weeks
3. Understanding of Instruments for measuring microclimatic variables *viz*., light, wind, temperature, humidity and precipitation 01 Week
4. Estimation of Total Carbon stock of an area. 02 Weeks
5. Understanding methods for selection of plants according to pollutant load of both air and water (includes field survey) 01 Week
6. Assessing air pollution tolerance of plant species using APTI (Air pollution tolerance index). 02 Week

7. Use Open Source Softwares for mapping the GPS points and generating a cover map. 01 Week
8. Measurement of Dissolved Oxygen (DO) from treated wastewater. 02 Weeks
9. Measurement of BOD and TDS from tank and treated pond. 02 Weeks
10. Determination of total dissolved and suspended solids in water. 01 Week

Suggested Readings:

1. Bell, J. R., Wheater, C. P., Cook, P. A., Bell, J. R., Wheater, C. P., Cook, P. A. (2011). Practical Field Ecology: A Project Guide. United Kingdom: Wiley.
2. Singh J.S., Singh S.P. & Gupta S.R. · 2014. Ecology, Environmental Science & Conservation. (2014). India: S. Chand Pvt. Limited.
3. Measurements for Estimation of Carbon Stocksin Afforestation and Reforestation Project Activities under the Clean Development Mechanism, Afield Manual UNFCCC.
4. Slingsby, D., Cook, C., Slingsby, D., Cook, C. (2016). Practical Ecology. United Kingdom: Macmillan Education UK.
5. Mukerji, K. G. (2013). Laboratory Manual of Food Microbiology. India: I.K. International Publishing House Pvt. Limited.

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