Skill Enhancement Courses

Appendix-77

Resolution No. 24-20

Vacuum Technology

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Prerequisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Vacuum Technology	2	0	0	2	Class XII	NIL

Learning Outcomes

Upon completion of this course, participants will:

1. Gain an understanding of the fundamentals of vacuum systems.
2. Identify and explain the types and applications of vacuum pumps.
3. Understand the construction, operation, and maintenance of vacuum pumps and gauges.
4. Develop practical skills in using and caring for vacuum systems.

Syllabus (30 hours)

Vacuum Pumps (4 weeks)

Introduction to vacuum, basic idea of exhaust pressure and base pressure. Units in vacuum and their interconversion, Need for vacuum in industrial systems, Application of vacuum in industry and research.

Vacuum pumps and their types – Positive displacement pumps, momentum transfer pumps and entrapment pumps. Categorization of vacuum pumps under primary and secondary pumps on the basis of pumping speed and throughput.

Construction and Working principle of Vacuum Pumps (8 weeks)

Positive Displacement pumps: Rotary Vane pump (direct / belt driven), Diaphragm pump, Piston pump, Roots/ Booster pump.

Momentum Transfer pumps: Turbo Molecular pump, Diffusion pump (need for water / Liquid N2 cooling), advantages and disadvantages.

Entrapment pumps: Ion-sorption pump, Cryopump

Maintenance and Care of Pumps (1 week)

Pump Care: Measures for pump care, fitting terminologies used in vacuum pumps like various types of flanges (KF series), O-rings and their material types [neoprene, viton, kalrez, teflon, Oxygen Free Copper (OFC)] etc.

Gauges for Pressure Measurement (2 weeks)

Pirani gauge (construction and working), Penning gauge (construction and working), hot cathode and cold cathode gauge (construction and working of CC - 10).

Major pump manufacturers in the world

Edwards, Pfeiffer Vacuum, Leybold, Alcatel Vacuum, Busch Vacuum Solutions, Agilent Technologies, Gardner Denver, VACUUBRAND, Bertin Technologies and RUVAC

Hands-On Activities/Experiments

1. Identification and fitting of pump components.
2. Practical demonstration and operation of rotary pump (Direct and /or Belt driven) with pirani readings
3. Practical demonstration and operation of diffusion pump with pirani and penning gauge head readings
4. Vacuum level measurement (pressure monitoring) using Pirani, Penning, hot and cold cathode gauges.
5. Practical demonstration and operation of turbo molecular pump with Display Control Unit (DCU)

List of Suggested Books

1. “Handbook of Thin Film Technology” by Leon I. Maissel and Reinhard Glang - McGraw Hill ISBN 13: 9780070397422

2. "Vacuum Technology and Applications" by David J. Hucknall - Elsevier ISBN: 978-0-7506-1145-9

3. “Materials Science of Thin Films: Deposition and Structure” - Milton Ohring - Academic Press ISBN: 978-0125249751

4. “Introduction to Vacuum Technology” - Milne Open Textbooks, Milne Library, State University of New York at Geneseo, Geneseo, NY 14454, ISBN : 978-1-942341-96-3

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.

SKILL ENHANCEMENT COURSE

ECO-PRINTING ON TEXTILES

CREDIT:2 (PRACTICAL)

TOTAL PERIODS: 60 PERIODS/ 15 WEEKS

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisites of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
ECO-PRINTING ON TEXTILES	2	0	0	4	XII Pass	NIL

1. Learning Objectives

- To familiarize students with various plant materials that are available locally.
- To impart hands-on skills for printing on fabrics using plant materials.
- To inculcate the skills for developing sustainable and environmentally friendly products.

2. Learning Outcomes

The student will be able to:

- To gain knowledge of materials and methods that are environmentally sustainable with low carbon footprints
- To develop skills in using plant materials in their natural form as a medium for textile fabric ornamentation
- To appreciate a user-friendly application of natural materials to pave way for a small-scale entrepreneurial set-up.

MAIN COURSE STRUCTURE

Credits: 2; Hours: 60

Unit I : Introduction to Flora (6 Hours)

- Understanding of locally available plant materials in relation to the hues, pigments present, seasonality in flowering or growth, cost and current usage - marigold flowers, rose flowers, eucalyptus leaves etc.

Unit II : Selection and Preparation of Fabric (16 Hours)

- Desizing and scouring of cellulosic and protein-based fabrics
- Mordanting of fabrics using metallic and non-metallic based mordants like Alum, FeSo4, Myrobalan, Pomegranate peels etc

Unit III : Eco Printing Techniques (18 Hours)

- Placement of plant material
- Transfer of prints: pounding, rolling, wrapping, steaming, boiling, ageing

Unit IV : Product Development (20 Hours)

- Development of simple products like stoles, kaftans, bags, cushions in different techniques, plant materials and textile substrates.

3. Teaching Methodology/Activities in the classroom

- Review of design effects of works of existing textile artists doing eco prints
- Sourcing of plant materials
- Hands-on exploration of developing prints on different fabrics and making a sample portfolio

4. Assessment Pattern for each Unit/practical. Component of Attendance in the Assessment of 1 credit theory course

- As per the university guidelines

5. Mapping with the next suggestive course

- Surface Ornamentation

- Textile Printing

6. Prospective Job Roles after a particular course

- The student would develop an aesthetic sensibility to work as a textile designer
- Having understood the costs involved and sourcing of plant material along with the techniques, the student could work as an entrepreneur as well.

Essential Reading

1. Bintrim, R. (2008). Eco Colour: Botanical dyes for beautiful textiles by India Flint.
2. Boutrup, J., & Ellis, C. (2018). The art and science of natural dyes: principles, experiments, and results. Schiffer Publishing, Limited.
3. Behan, B. (2018). Botanical inks: Plant-to-print dyes, techniques and projects. Hardie Grant Publishing

Suggestive Reading

1. Dean, J. (1999). Wild color. *(No Title)*.

SKILL ENHANCEMENT COURSE

SURFACE ORNAMENTATION

CREDIT:2 (PRACTICAL)

TOTAL PERIODS: 60 PERIODS/ 15 WEEKS

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisites of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Surface Ornamentation	2	0	0	4	XII Pass	NIL

1. Learning Objectives:

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

- Understand the fundamental techniques of surface ornamentation such as embroidery, appliqué, and printing.
- Develop creative design ideas using both traditional and contemporary embellishment methods.
- Apply appropriate ornamentation techniques to enhance the aesthetic appeal of textile surfaces.

2. Learning Outcomes

Upon successful completion of the course, students will be able to:

- Demonstrate basic to intermediate skills in various surface ornamentation techniques.
- Create original textile samples and products using learned embellishment methods.
- Analyze and evaluate ornamentation methods for their design, function, and cultural relevance.

3. Main Course Structure

Unit I: Fabric Manipulation and Thread Structures (14 Hours)

Students will learn basic fabric alteration techniques like cutting and thread removal. They will also explore decorative thread work such as macramé, braiding, crochet, and tatting.

- Fabric manipulation – cuts, removal of threads

- Macramé and braiding
- Lace making – crochet and tatting

Unit II: Surface Decoration and Colour Application (16 Hours)

This unit covers hand-based surface embellishments, including embroidery and ari work. Students will also learn techniques such as fabric painting, dyeing, and various printing methods.

- Embroidery and ari work
- Use of Embellishments
- Hand Painting
- Dyeing – tie and dye, batik
- Printing – block, screen, stencil

Unit III: Surface Layering and Product Development (18 Hours)

Students will practice layering techniques such as appliqué, quilting, pleats, and tucks. These skills will be used to create finished textile products.

- Appliqué work – simple, cut, felt
- Quilting – hand and machine
- Pleats and tucks
- Product development using the above design exploration techniques

4. Teaching Methodology/Activities in the classroom

- Hands-on demonstrations of embroidery, dyeing, printing, and appliqué techniques.
- Guided practical sessions and sample-making.
- Peer critiques, mini-projects, and optional field visits to artisan centers.

5. Assessment Pattern for each Unit/practical. Component of Attendance in the Assessment of 1 credit theory course

- As per the university guidelines

6. Mapping with the next suggestive course

- Advanced Surface Embellishment
- Textile/Fashion Product Development

- Craft Cluster Documentation
- Portfolio & Professional Practice

7. Prospective Job Roles after a particular course

- The student would collaborate with artisan communities or NGOs to innovate and document traditional surface ornamentation techniques.
- Graduates can pursue careers as embroidery or surface designers, creating embellished textiles for fashion, home décor, or product development.
- They may manage dyeing and printing processes, work with artisans to modernize traditional ornamentation techniques, and may also choose to become entrepreneurs in the field.

Essential Readings:

1. Juracek, A. Judy,2000,Soft Surface, Thames & Hudson Ltd.

2. Milne D'Arcy Jean,2006, Fabric Left Overs, Octopus Publishing Group Ltd.

3. Singer Margo,2007, Textile Surface Decoration-Silk & Velvet, A&C Black Ltd.

Suggested Readings:

Manglik, M. R. (2024). *Surface ornamentation techniques*. EduGorilla Publication.

SKILL ENHANCEMENT COURSE
DIGITAL TOOLS FOR INTERIOR DESIGNING

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Credit: 2 (Practical)
Total Periods: Practical 60 Periods

Course title & Code	Credits	Credit distribution of the course			Eligibility Criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Digital Tools for Interior Designing	**02**	**0**	0	**02**	12th pass	NIL

Learning Objectives

- To provide an understanding about the importance of digital tools in Interior Designing.
- To help students learn the basics of two-dimensional drawing software – AutoCAD.
- To acquaint the student with basic three-dimensional software such as Sketch Up and 3ds MAX.
- To familiarize the students with the innovative Artificial Intelligence tools related to designing.

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Learning Outcomes

After completion of this course, the students will be able to

- Use digital tools such as two-dimensional software - AutoCAD, three-dimensional software such as SketchUp and 3ds Max for designing the interiors.
- Take up jobs as designers with interior designers, architects and real estate firms.
- Apply for advanced space designing and three-dimensional designing software.

SYLLABUS

Course Contents:

Unit I: Introduction to Computer Aided Design Software (04 hours)

- Introduction to two-dimensional software - AutoCAD.
- Introduction to three-dimensional software such as **Sketch Up** and **3ds Max.**
- Use of Artificail intelligence in interior designing.

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Unit II: Two-dimensional Software – AUTOCAD **(15 hours)**

- Using simple commands
- Measuring, adding dimensions and making tables
- Ensuring precision through polar tracking object snaps, grid snap
- Changing units and dimension styles
- Adding text to the drawing
- Adding colours and patterns
- Creating blocks for subsequent drawings
- Use of layers in designing
- Using design center
- Saving, sharing and printing of the document
- Preparation of simple 2D plans
- Preparation of elevation plans (2D)

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Unit III Three-dimensional software **(36 hours)**

- Introduction to **SketchUp**
- Basic commands in SketchUp. - Navigation Tools, Modelling Tools, Measurement, materials, styles and advanced drawing techniques
- Layout and Printing
- Introduction to **3ds MAX**.
- Object Creation and modelling – basic and advanced
- Applying Materials and textures
- Lighting and Camera
- Use of VRay
- Rendering

Unit IV: Use Of AI in Interior Design **(05 hours)**

- Basic Tools – Spacely AI, Interior Render AI, RoomGPT 10, AI Home Design etc.
- Augmented Reality (AR) and Virtual Reality (VR)

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ESSENTIAL READINGS

- Brightman, M. (2018). The SketchUp workflow for architecture: Modeling buildings, visualizing design, and creating construction documents with SketchUp Pro and LayOut (2nd ed.). John Wiley & Sons.
- Chopra, A., & Kauker, R. (2017). SketchUp for dummies (2nd ed.). John Wiley & Sons.
- Murdock, K. (2023). Autodesk 3ds Max 2024 basics guide. SDC Publications.

SUGGESTED READINGS:

- Derakhshani, D. (2019). Introducing 3ds Max 2020. Sybex.

- Mastering Auto CAD 2021 and Auto CAD LT 2021. John Wiley & Sons.

SKILL ENHANCEMENT COURSE

RADIO JOCKEYING

CREDIT:2 (PRACTICAL)

TOTAL PERIODS: PRACTICALS; 60 PERIODS

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		
Radio Jockeying	2	0	0	2	XII Pass	NIL

Learning Objectives

- To provide foundational knowledge of radio as a medium of mass communication.
- To develop voice acting, articulation, and studio operation skills.
- To enable students to conceptualize, script, and host radio programs.

Learning Outcomes

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

- Understand the evolution, structure, and functioning of various radio formats including FM and community radio.
- Develop core vocal and technical skills essential for radio jockeying, such as modulation, articulation, and equipment handling.
- Design and present engaging radio segments through scripting, anchoring, and live audience interaction.

MAIN COURSE STRUCTURE

Credits: 2; Hours: 60

Unit I: Understanding Radio as a Medium (20 periods)

Unit Description:

Introduces learners to the evolution of radio in India and the rise of private and community radio, with insights into the personality traits of successful RJs.

Sub Topics:

- Evolution and formats of radio broadcasting
- Introduction to private and community radio
- Role and personality traits of a Radio Jockey
- Case studies of successful RJs and shows

Unit II: Voice Acting and Radio Production Techniques (20 periods)

Unit Description:

Covers voice training, articulation, studio handling, and real-time show hosting. Includes mock studio exercises and interaction with professionals.

Sub Topics:

- Voice warm-up, breath control, pitch, tone, and articulation
- Microphones, audio consoles, recording software basics
- Music curation and segment planning
- Show scheduling, live audience interaction
- Script reading, diction, intonation
- Anchoring practice and feedback

Unit III: Radio Production and Editing (20 periods)

Unit Description:

Focuses on scripting, editing, and understanding varied show formats. Learners develop and record promos and jingles.

Sub Topics:

- Popular show formats (drive-time, breakfast, late-night)
- Writing for the ear: RJ links, Interviews, Drama, jingles, PSAs, Vox pop
- Recording and audio editing basics

Teaching Methodology/Activities in the classroom

- Studio-based simulations and mock hosting
- Script writing and live show rehearsals

- Guest sessions with industry professionals
- Field visits to radio stations

Assessment Pattern for each Unit/practical: Continuous evaluation and assessment through Class assignment/Projects/Presentation/ Tests

Mapping with the next suggestive course: Advanced curse in Radio Jockeying/Anchoring

Prospective Job Roles after a particular course: Radio Jockey in commercial/community radio, Radio show producer, Podcast host, Voice-over artist, Dubbing artist, script writer for audio media

Essential Readings:

- Pannu, Parveen & Tomar, Yuki Azaad. (2012). *Communication for Development*. New Delhi: IK International Publishing House Pvt. Ltd.
- Chatterjee, P.C. (2011). *Broadcasting in India*. Sage.

Suggested Readings:

- Berry, C. (1973). *Voice and the actor*. New York: Macmillan Publishing.
- Reese, D. E., Gross, L. S., & Gross, B. (2012). *Audio production work text: Concepts, techniques, and equipment* (8th ed.). Burlington, MA: Focal Press.

SEC Course Proposed by Department of Biochemistry and Daulat Ram College
Track : Laboratory Techniques Series

SEC Course: MEDICAL DIAGNOSTICS

1. CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Coursetitle &Code	Credits	Credit distribution of the course			Eligibility criteria	Pre- requisite ofthe course
		Lecture	Tutorial	Practical		
Medical Diagnostics	2	0	0	2	XII pass	None

2. Learning Objectives

This course aims to train the students in skills required in biochemical, hematological and immune- diagnostics through the use of various procedures, methods and equipment for the purpose of disease diagnosis. The students are skill trained to develop the knowledge, technical and critical thinking skills essential to safely and reliable collection and analysis of patient samples. The will be skill trained to work in diagnostics labs in hospitals, research/ pathology/ Laboratories and Pharma industry.

3. Learning Outcomes

After the completion of the course the students will be able to

- Process and store bio-samples following Biosafety practices.
- Perform various Biochemistry assays.
- Perform Haematological analysis & diagnosis of diseases.
- Perform Immunodiagnostic assays.
- Record data and analyse report.

4. Main Course Structure

Unit 1 – Laboratory safety and standards **4 Hours**

- Biosafety Practices, Sample collection, processing, labelling, preservation and record keeping.
- Bio-waste disposal techniques

Unit 2– Hematological Investigations **16 hours**

- RBC count, Erythrocyte sedimentation rate, packed cell volume
- Total Leukocyte count, Differential Leukocyte count, Absolute Eosinophil count
- Hemorrhagic disorders: Clotting time
- Blood group determination

Unit 3– Biochemical Investigations **28 hours**

Biochemical markers for disease. Serum, sputum and urine analysis.

- Assays of salivary markers of acute myocardial infarction: CK-MB/ cTn (cardiac markers)
- Diabetes markers
- Estimation of Serum electrolytes: Na, K, Ca, P
- Estimation of Serum bilirubin, direct and indirect, Serum Transaminases : SGPT/SGOT (Liver Function Test)
- Serum Hormone assays: Thyroid, TSH (ELISA) (endocrine Function)
- Analysis of Urine for abnormal constituents: Proteins, sugar, ketones

Unit 4 –Immuno Diagnostics **8 Hours**

- Rapid Antigen assay.
- RT-PCR test

Unit 5-- Visit to a Diagnostic lab **4 Hours**

Automation and real lab scenario experience

5. Teaching Methodology/Activities in the classroom

Introduction to basic concepts and the principles of the practicals to be performed with power point presentations. Students made aware of safety protocols and which nave to be strictly followed. Hands on training of the advance instruments to be used and the lab practicals to be performed

6. Assessment Pattern for each Unit/practical.

Unit 1: 10 marks

Student will be assessed by viva- voce, quiz, written assessment and on participation in various activities and practicals in class on the following topics:

1. Biosafety measures.
2. Collection and storage of samples.
3. Bio waste disposal techniques

Unit 2: 20 marks

Students will be assessed on the Knowledge of the concepts and the protocols of Haematological investigations by viva- voce, quiz, written assessment and on participation in various activities and practicals on the following topics:

1. RBC and differential counting
2. Blood group typing

Unit 3: 25 marks

Students will be assessed on the knowledge of the concepts and the protocols of Biochemical investigations by viva- voce, quiz, written assessment and on participation in various activities and practicals on the following topics:

1. Disease diagnosis of myocardial infarction and Diabetes
2. Liver function test and its importance in disease diagnosis.
3. Hormone assays
4. Importance of urine analysis in disease diagnosis

Unit 4: 15 marks

Students will be assessed on the knowledge of the concepts and the protocols of Immuno-Diagnostics by viva- voce, quiz, written assessment and on participation in various activities and practicals on the following topics:

1. Disease diagnosis by Rapid Antigen test
2. Disease diagnosis by RT-PCR test

Unit 5: 10 marks

Students will be assessed on the basis of field report prepared on the Diagnostic Lab visit.

7. Mapping With next suggestive course

Mapping done with SEC: Advance Molecular Diagnostics

8. Job opportunities

The Medical Diagnostics skill program prepares students to become integral members of the health care system. Students trained in lab skills will be employable in research labs, R & D labs in Pharma andBiotechnology industry and Diagnostic labs.

9. Essential / Suggested readings:

- Sood R. (2015) Concise book of Medical Laboratory technology: Methods and interpretation. 2nd edition. The health Science Publisher 2015
- Sant M. (2020) Textbook of Medical Laboratory Technology. CBS 2020

METHODS IN EPIDEMIOLOGICAL DATA ANALYSIS

1. Credit Distribution, Eligibility and Pre-Requisites of the Course

2. Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course
		Lecture	Tutorial	Practical		
Methods in Epidemiological Data Analysis	2	0	0	2	Class XII	Nil

2. Learning Objectives

The Learning Objectives of this course are as follows:

- To gain practical experience through hands-on training with 'R', a free software environment for statistical computing and graphics with particular reference to epidemiological data.
- To acquire skills in presenting epidemiological data in different formats through tables and graphs.
- To learn about different epidemiological and health parameters related to communicable and non-communicable diseases.
- To understand relationships between different epidemiological variables using correlation and regression analyses.
- To learn how to design hypotheses and analyze epidemiological data to draw statistically significant conclusions.

3. Learning Outcomes

Upon successful completion of the course, students will be able to:

- Install R and execute various commands and functions in R to analyse epidemiological data.
- Generate tables and graphs to organize, stratify and present epidemiological data using R.
- Calculate various epidemiological parameters like prevalence, incidence, and vital statistics, and measures such as morbidity, mortality, DALYs, and fertility rates.
- Perform correlation and regression analyses
- Conduct various tests of significance and make statistical inferences.

4. Main Course Structure

Unit I: Introduction to 'R' statistical package (5 weeks/ 20 Hours)

Laboratory 1: Installation of R and RStudio, performing essential operations & commands, and

exploring basic data types and their functions in R.

Laboratory 2: Importing and exporting different types of data (CSV, Excel) and manipulating key data structures in R (vectors, data frames, lists).

Laboratory 3: Performing data cleaning tasks including handling missing data, removing duplicates and transforming variables.

Laboratory 4: Performing basic data manipulations such as subsetting, merging, filtering, sorting, etc.

Unit II: Descriptive Epidemiology and Visualization using R (5 weeks/ 20 Hours)

Laboratory 5: Summarizing epidemiological data with tables and stratify data based on key variables, such as age, gender, or risk factors to account for confounding variables.

Laboratory 6: Calculation of different statistical parameters including measures of central tendency (mean, mode, median and partition values) and measures of dispersion (range, standard deviation, variance, coefficient of variance and covariance).

Laboratory 7: Representation of epidemiological data as graphs (scatter plots, bar plots, histograms, pie charts, box plots, epidemic curve, etc.).

Laboratory 8: Calculation of epidemiological parameters and health indicators like prevalence, incidence, vital statistics (rates, ratios, and proportions), morbidity, mortality, life expectancy, hospitalization rate, DALYs (Disability-Adjusted Life Years), fertility rates, attack rate, case fatality rate, herd immunity threshold, etc. for communicable and non-communicable diseases.

Unit III: Inferential Statistical Analysis of Epidemiological Data Using R (5 weeks/ 20 Hours)

Laboratory 9: Correlation and linear regression analysis on epidemiological data.

Laboratory 10: Tests of significance for single mean and difference of means for large (z-test) and small samples (Student's t-test for independent and dependent samples).

Laboratory 11: Chi-square tests for independence, homogeneity, and goodness-of-fit to analyze categorical epidemiological data.

Laboratory 12: F-test, one-way and two-way ANOVA on epidemiological data.

5. Teaching Methodology/Activities in the classroom

Hands-on activities using real or simulated datasets, Online Databases and Tools, Videos, Project based learning, Workshops, etc.

6. Assessment Pattern for each Unit/practical.

1. Maintenance of practical records (10 Marks)
2. Viva Voce (10 marks)

Unit I: Introduction to 'R' statistical package

1. Installation of R and RStudio. Execution of basic operations and importing/ exporting of data. (10 Marks)
2. Problem solving activity based on use of various commands and functions in R for data cleaning and manipulation on provided datasets. (10 Marks)

Unit II: Descriptive Epidemiology and Visualization using R

1. Presentation of descriptive analysis of epidemiological data with appropriate graphs and tables using R. (10 Marks)
2. Class activity focused on interpreting epidemiological parameters related to any disease outbreak. (10 Marks)

Unit III: Inferential Statistical Analysis of Epidemiological Data Using R

1. Practical test for execution of various inferential tests such as correlation, regression, T-tests, chi-square tests, and ANOVA in R. (8 Marks)
2. Group report/ presentation to critically analyze/ review the statistical analysis performed in a published epidemiological study. (12 marks)

7. Mapping with the next suggestive course

DSE :Research Methodology (Sem VI/ VII)

8. Prospective Job Roles after a particular course

Epidemiological Data Analyst, Biostatistical Data Analyst, Survey Coordinator, Public Health/Disease Surveillance Assistant, Community Health/Social/NGO Worker, Project Assistant in academic and research labs.

9. Essential readings:

- Park, K. (2021), 26th Edition. Park's Textbook of Preventive and Social Medicine. Banarsidas Bhanot Publisher, ISBN: 9789382219163.
- A. Stewart (2022), 5th Edition. Basic Statistics and Epidemiology: A Practical Guide. ISBN: 9781003148111.
- Daniel, W.W. and Cross, C.L. (2019), 11th Edition. Biostatistics: A foundation for analysis in the health sciences. New York, USA: John Wiley & Sons. ISBN: 9781119588825.
- Website for 'R': www.r-project.org
- Aho, K. A. (2023). Foundational and Applied Statistics for Biologists Using R. United States: CRC Press. ISBN: 9781032477411.
- Carstensen, B. (2021), 1st Edition Epidemiology with R. United Kingdom: Oxford University Press. ISBN: 9780198841326.

10. Suggestive readings:

- Christiansen-Lindquist, L., Christiansen-Lindquist, L., Wall, K. M., Wall, K. M. (2024). Fundamentals of Epidemiology. United States: Springer Publishing Company. ISBN: 978-0826166937.
- Rahman, A., Abdulla, F., Hossain, M. M. (2024). Scientific Data Analysis with R: Biostatistical Applications. United States: CRC Press. ISBN: 9781040146972.
- Webb, P., Bain, C., Page, A. (2024). Essential Epidemiology: An Introduction for Students and Health Professionals (5th ed.). Cambridge: Cambridge University Press. ISBN: 9781009415361.

- Welham, S. J., Mead, A., Clark, S. J., Gezan, S. A. (2024). Statistical Methods in Biology: Design and Analysis of Experiments and Regression. United States: CRC Press LLC. ISBN: 9780826166944.
- Quinn, G. P., Keough, M. J. (2023). Experimental Design and Data Analysis for Biologists. United Kingdom: Cambridge University Press. ISBN: 9781107036710.
- Triola, M.M., Triola M.F., Roy J. (2019). 2nd Edition. Biostatistics for Biological and Health Sciences. Harlow, UK: Pearson Education Ltd. ISBN: 9789353436537.
- A. Aschengrau and G. R. Seage, (2018), 4th Edition. Essentials Of Epidemiology In Public Health Ann Aschengrau and George R. Seage. ISBN:97812841283s52
- Hui, E.J.M. (2018). 1st Edition. Learn R for Applied Statistics With Data Visualizations, Regressions, and Statistics Hui. Springer New York, ISBN: 9781484242018.
- Pagano, M. and Gauvrean, K. (2018). 2nd Edition. Principles of Biostatistics. California, USA: Duxbury Press. ISBN-13: 9781138593145.
- Bertram K.C. Chan (2016), 1st Edition. Biostatistics for Epidemiology and Public Health Using R. ISBN: 9780826110268
- Norman, G.R. and Streiner, D.L. (2014). 4th Edition. Biostatistics: The bare essentials, New York, USA: McGraw-Hill Medical. ISBN: 978-1607951780.
- Zar, J.H. (2014). 5th Edition. Biostatistical analysis. USA: Pearson. ISBN-13: 9789332536678.
- Katz, D.L., Elmore, J.G., Wild, D. Lucan, S.C. (2013). 4th Edition. Jekel's epidemiology, biostatistics, preventive medicine and public health. Philadelphia, USA: Elsevier Saunders. ISBN: 978-1455706587.
- Glantz, S. (2012). 7th Edition. Primer of biostatistics. New York, USA: McGraw-Hill Medical. ISBN-13: 9780071781503.
- Bonita, R., Beaglehole, R. and Kjellstrèom, T. (2006). 2nd Edition. Basic epidemiology. Geneva, Switzerland: World Health Organization. ISBN-13: 978-9241547079.

METHODS IN EPIDEMIOLOGICAL DATA COLLECTION

1. Credit Distribution, Eligibility and Pre-Requisites of the Course

Course title and Code	Credits	Credit distribution of the course			Eligibility Criteria	Prerequisite of the Course
		Lecture	Tutorial	Practical		
Methods in Epidemiological Data Collection	2	0	0	2	Class XII	Nil

2. Learning Objectives

The Learning Objectives of this course are as follows:

- To understand different types of epidemiological studies and learn how to effectively apply these to analyze real-world public health scenarios.
- To acquire practical skills in extracting epidemiological data from various sources and ability to interpret them.
- To understand the basics of epidemiological study designs addressing key issues like ethical considerations, informed consent and confidentiality ensuring research integrity.
- To understand the ethical and regulatory guidelines as per The Declaration of Helsinki established by the World Medical Association (WMA), National Ethical Guidelines for Biomedical and Health Research involving Human Participants specified by the Indian Council of Medical Research (ICMR) and International guidelines based on The Council for International Organizations of Medical Sciences (CIOMS).
- To learn about the role of National Ethics Committee Registry for Biomedical and Health Research (NECRBHR), Department of Health Research (DHR).
- To learn the principles of questionnaire designing for epidemiological surveys and implementation of these to collect data.
- To develop proficiency in organizing, analyzing and presenting epidemiological data using tools like Excel/ Google Forms/ REDCap, etc.

3. Learning Outcomes

Upon successful completion of the course, students will be able to:

- Identify and differentiate among various epidemiological study designs.
- Develop skills to extract and interpret data related to disease frequency, distribution, and health determinants from public health databases.

- Gain knowledge about the Declaration of Helsinki, a foundational document that laid ethical principles to guide physicians and researchers in conducting research involving human subjects established by the World Medical Association (WMA).
- Understand the National and International Ethical Guidelines for the research involving human participants as specified by ICMR and CIOMS, respectively.
- Appreciate the role of NECRBHR, DHR in processing the applications for mandatory requirement of institutional ethics committee to conduct biomedical and health research involving human participants.
- Identify and address ethical challenges in data collection, including issues of informed consent, privacy, and cultural sensitivity in accordance with the National Ethical Guidelines for Biomedical and Health Research involving Human Participants as laid down by the Indian Council of Medical Research (ICMR).
- Design a comprehensive epidemiological study, including selecting the appropriate design, defining the target population, and calculating sample size and power.
- Gain the ability to develop and analyze questionnaires for epidemiological studies using tools like Google Forms or Epicollect.
- Implement questionnaires to collect epidemiological data.
- Develop skills to organize, analyze and present data using tools such as Excel, Google Forms, or REDCap, ensuring effective communication of results.

4. Main Course Structure

Unit I: Introduction to Epidemiological Studies and Data Extraction (5 weeks/ 20 Hours)

Laboratory 1-2: Review different types of epidemiological studies: Descriptive studies, Analytical studies (cohort, case-control, cross-sectional) and Experimental studies (RCTs) using research papers/ case studies, etc.

Laboratory 3-4: Extraction of epidemiological data from publicly available databases (e.g., WHO/ CDC/ National Health Surveys/ NCRP/ ICMR/ any other public domain) for disease frequency, distribution of disease and determinants of disease.

Unit II: Epidemiological Study Design and Ethical Considerations (3 weeks/ 12 Hours)

Laboratory 5: Simulation of scenarios involving the Ethics Committee (as per the guidelines of ICMR, DHR) processes related to forms and guidelines, to address ethical dilemmas in data collection (e.g., informed consent, data privacy, confidentiality, cultural sensitivity, etc.).

Laboratory 6: Design a study plan for a research problem, including selection of appropriate study type, subjects and sampling method, calculation of sample size and power of the study, measures for sampling bias reduction.

Unit III: Epidemiological Survey Design, Implementation and Data Organization

(7 weeks/ 28 Hours)

Laboratory 7-8: Designing a questionnaire for an epidemiological study (e.g., survey on smoking, diabetes, hypertension, lung cancer risk, etc.) using tools such as manual methods/ Google Forms/ Epicollect, etc.

Laboratory 9-10: Class activity to simulate conducting interviews or administering surveys to a sample group.

Laboratory 11-12: Importing, organizing and presenting epidemiological data (obtained from public database/class activity) in tabulated/ graphical form using Excel/ Google forms/ REDCap/ etc.

5. Teaching Methodology/Activities in the classroom

Hands-on sessions, Analysis of Case Studies, Simulations, Online Databases and Tools, Videos, Research Articles, Project based learning, Workshops, etc.

6. Assessment Pattern for each Unit/practical.

Overall Assessment will be based on the following:

1. Maintenance of practical records (10 Marks)
2. Viva Voce (10 marks)

Unit I: Introduction to Epidemiological Studies and Data Extraction

1. Analysis and presentation of summary of epidemiological data from published research articles/ case studies. (10 Marks)
2. Mini report submission on the extracted epidemiological data with calculations and interpretation of various parameters. (10 Marks)

Unit II: Epidemiological Study Design and Ethical Considerations

1. Real Time simulations to present comprehension of ethical issues involved during data collection. (7 Marks)
2. Design of study plan for an epidemiological study including the study design incorporating ethical considerations, unbiased sampling and optimum sample size. (8 Marks)

Unit III: Epidemiological Survey Design, Implementation and Data Organization

1. Design of a questionnaire including with relevant, specific and appropriate questions using tools like Google Forms/ Epicollect (10 marks)
2. Class activity simulating the interview to effectively conduct an epidemiological survey. (5 Marks)
3. Effective organization and presentation of the data obtained from public database/class activity with interpretation. (10 marks)

7. Mapping with the next suggestive course

Methods in Epidemiological Data Analysis

8. Prospective Job Roles after a particular course

Epidemiological Data Collector, Survey Coordinator, Public Health/Disease Surveillance Assistant, Community Health/Social/NGO Worker, Project Assistant in academic and research labs.

9. Essential readings:

- Park, K. (2021), 26th Edition. Park's Textbook of Preventive and Social Medicine. Banarsidas Bhanot Publisher, ISBN: 9789382219163.
- A. Stewart (2022), 5th Edition. Basic Statistics and Epidemiology: A Practical Guide. ISBN: 9781003148111.
- Daniel, W.W. and Cross, C.L. (2019), 11th Edition. Biostatistics: A foundation for analysis in the health sciences. New York, USA: John Wiley & Sons. ISBN: 9781119588825.
- Website for NECRBHR, DHR: https://naitik.gov.in/DHR/Homepage
- Website for Epicollect: https://five.epicollect.net/
- Website for REDCap: https://project-redcap.org/

10. Suggestive readings:

- Christiansen-Lindquist, L., Christiansen-Lindquist, L., Wall, K. M., Wall, K. M. (2024). Fundamentals of Epidemiology. United States: Springer Publishing Company. ISBN: 978-0826166937.
- Webb, P., Bain, C., Page, A. (2024). Essential Epidemiology: An Introduction for Students and Health Professionals (5th ed.). Cambridge: Cambridge University Press. ISBN: 9781009415361.
- Welham, S. J., Mead, A., Clark, S. J., Gezan, S. A. (2024). Statistical Methods in Biology: Design and Analysis of Experiments and Regression. United States: CRC Press LLC. ISBN: 9780826166944.
- Quinn, G. P., Keough, M. J. (2023). Experimental Design and Data Analysis for Biologists. United Kingdom: Cambridge University Press. ISBN: 9781107036710.
- Triola, M.M., Triola M.F., Roy J. (2019). 2nd Edition. Biostatistics for Biological and Health Sciences. Harlow, UK: Pearson Education Ltd. ISBN: 9789353436537.
- A. Aschengrau and G. R. Seage, (2018), 4th Edition. Essentials Of Epidemiology In Public Health Ann Aschengrau and George R. Seage. ISBN:9781284128352.
- Bertram K.C. Chan (2016), 1st Edition. Biostatistics for Epidemiology and Public Health Using R. ISBN: 9780826110268.

- Katz, D.L., Elmore, J.G., Wild, D. Lucan, S.C. (2013). 4th Edition. Jekel's epidemiology, biostatistics, preventive medicine and public health. Philadelphia, USA: Elsevier Saunders. ISBN: 978-1455706587.
- Bonita, R., Beaglehole, R. and Kjellstrèom, T. (2006). 2nd Edition. Basic epidemiology. Geneva, Switzerland: World Health Organization. ISBN-13: 978-9241547079.
- Dawson, B., Trapp, R.G. (2004). 4th Edition. Basic and clinical biostatistics. New York, USA: Tata McGraw-Hill. ISBN: 978-0071410175.