Semester VIII

Generic Electives (GE):

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical / Practice		
Contribution of Indian Knowledge System to Science, Engineering and Technology	**4**	**3**	**1**	**0**	NIL	NIL

Learning Objectives

The course presents a gainful insight to some of the areas of application of IKS in science, engineering and technology. The course presents to the students the origin of science and technology that they can relate, appreciate and explore further as per their interest.

Learning Outcomes

- Get used to the foundation of Sanskrit language in NLP
- Understand the important aspects of Indian Numeral Systems
- Understand the use of time, length and weight measurements in ancient India
- Identify the origin of modern day binary number system used in modern day computers
- Develop an awareness of contribution of Indian astronomy
- Develop familiarity of ancient Indian pursuits in various areas of science and technology

SYLLABUS

Theory:

Unit I: Natural language processing

Components of a language; Panini's work on Sanskrit Grammar; Phonetics in Sanskrit; Patterns in Sanskrit vocabulary; Computational concept is *Astadhyayi*; Logic for sentence construction; Importance of verbs; Role of Sanskrit in NLP (12 hours)

Unit II: Units of Measurements

The concept of zero and its importance; Large numbers and their representations; Place values of numerals; Decimal system; Different approaches to represent numbers; Measurements for time, distance and weights; Pingala's Binary mathematics (9 hours)

Unit III: Contributions in Astronomy

Historical developments of astronomy in India; Elements of Indian calendar; *Pancanga*- the Indian calendar system; *Aryabhatiya Sidhanta*; Distance and velocity of a planet; Apparent motions of the stars due to earth's motion; Parallax in solar eclipse; Visibility corrections; Eclipses of the sun and the moon; Astronomical instruments (12 hours)

Unit IV: Science and Engineering

Metal extraction processes of Au, Zn, Cu and its alloys, Fe, Hg, Pb, Ag; Apparatus used for extraction; Lost wax casting of artefacts; Irrigation and water management; Dyes and painting technology; surgical techniques; shipbuilding (9 hours)

References:

1. *Introduction to Indian Knowledge System: Concepts and Applications,* B. Mahadevan, V R Bhat, Nagendra Pavan R N, PHI Learning Pvt Limited, 2022.
2. *Ancient Hindu Science: Its impact on the Ancient and Modern worlds*, Alok Kumar; Jaico Publishing House, 2019.
3. *Aryabhatiya of Aryabhat* by K.S. Shukla and K.V. Sarma, Indian National Science Academy, New Delhi (1976)

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

Generic Electives (GE):

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		
Understanding Public Health: Infection to Informatics (GE)	**4**	**2**	**0**	**2**	**12th Pass**	**Nil**

Learning Objectives

The course introduces students to the fundamentals of Public Health with reference to Infectious Diseases and Informatics. The Covid-19 pandemic has taught us the importance of having a good public health system and this course will prepare the future generation for a better understanding of the threats of zoonotic diseases and corresponding public health measures. Apart from theoretical background in Zoonotic diseases, infectious diseases prevalent in our country, this course will delve into the fundamentals of outbreaks and infection through case studies, data analysis and health informatics.

Learning Outcomes

This course enables students to become responsible and aware citizens and to act promptly and systematically in future outbreaks and epidemics. Upon completion of the course the students would be able to:

- Understand the differences of Outbreak, Endemic, Epidemic and Pandemic
- Prepare themselves and the society for better awareness of Public Health system and Disaster Management responses
- Understand how Drugs and Vaccines are created and Clinical Trials are designed
- Learn the basics of health informatics and analysis of public health data
- Access and Analyse Public Health datasets
- Create relevant Citizen Science projects on Public Health
- Create Posters, fliers and Advertisements for Awareness and preventing misinformation.

Keywords: Public Health, Zoonotic Disease, Drugs and Vaccines, Endemic, Epidemic, Pandemic, Epidemiology, Pathogens, Clinical Trial, Personalized Medicine.

SYLLABUS

Unit I: Understanding Outbreak, Endemic, Epidemic, Pandemic. Infectious Diseases and Lifestyle Diseases. (4 hours)

Unit II: Zoonotic diseases, Pathogens (viruses, bacteria, parasites and fungi) and Infection Process, Epidemiology, Disaster Management, Biohazard and Bioweapons. (12 hours)

Unit III: Medicine and Vaccine, Introduction to Drug designing, Vaccine types, Clinical Trials, Trial Design, Personalized Medicine and Precision Medicine, Medical Terminology & Medical Ethics (8 hours)

Unit IV: Introduction to Public Health, Public Health Data Analysis, International Health Issues, Institutes of Public Health, Public health policy (8 hours)

Practical Components/Projects (60 hours)

- Case Studies of Outbreak, Pandemic. Designing Public Awareness Posters, fliers and Advertisement, Engaging with social media misinformation.
- Designing Health Survey and Disaster Management Awareness Survey. Creating Citizen Science Projects related to Public health and Zoonotic Diseases.
- Public Health dataset analysis, Searching and curating Databases, Experimental design for vaccine Preparation and Clinical trials.

References:

1. *Introduction To Public Health* Mary Jane Schneider, Jones and Bartlett Publishers, Inc; 6th edition, 2020.

2. *Oxford Handbook of Infectious Diseases and Microbiology* (Oxford Medical Handbooks) OUP Oxford; 2nd edition, 2016.
3. *Kuby Immunology*, WH Freeman; 8th ed. 2018.
4. *Spillover – Animal Infections and the Next Human Pandemic*.David Quammen, W. W. Norton & Company; 2012.
5. *Emergence of Zoonotic Diseases in India: A Systematic Review.* Dhiman RC, Tiwari A *Med Rep Case Stud* 3: 163. doi: 10.4172/2572-5130.1000163, 2018.
6. Changing patterns of infectious disease, Cohen, Mitchell L. *Nature,* Volume 406, pages 762–767, 2000.
7. *Manual on Zoonotic Diseases of Public Health Importance*. National Centre for Disease Control (https://ncdc.gov.in/WriteReadData/l892s/File618.pdf), 2016.
8. *Exploring the relationship between the emergence of zoonotic diseases and the inhuman touch of habitat loss and wildlife trade.* Tiwary, N. K., Singh, G., & Bhaduri, A. in *Multidimensional Approaches to Impacts of Changing Environment on Human Health* CRC Press, Taylor & Francis Group, 2022.
9. *Citizen Science Comes of Age*, Aisle Irvine, *Nature* 562, 480-482 (2018) *doi: https://doi.org/10.1038/d41586-018-07106-5*
10. *Citizen Science for Public Health*, Lea Den Broeder et al., *Health Promotion International*, Volume 33, Issue 3, Pages 505–514, 2018.

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Generic Electives (GE):

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Income Tax Law and Practice	**4**	**3**	**0**	**1**	**PASS IN XII**	**NIL**

Learning Objectives

This course aims to provide comprehensive knowledge of various heads of income and focuses on the computation of the total income and tax liability of an individual as per the Income Tax Act 1961.

Learning outcomes

After completion of the course the student will be able to;

- Explain the basic concepts, residential status of the assessee and incidence of tax.
- Develop an understanding of the nuances of the salaries, various allowances and perquisites available under the head income from Salaries.
- Develop an understanding of the concept of self-occupied and let out property under the head income from house property.
- Compute the income under the head profits and gains of business or profession and capital gains.
- Compute incomes covered under the head income from other sources.
- Explore the concept of including the income of other persons in the assessee's income.
- Compute the total tax liability of an individual after allowing for permissible deductions and exemptions.

Syllabus

Theory

Unit 1: Basic concepts and Residential Status (12 hours)

Basic concepts: person, assessee, income, previous year, assessment year and PAN; structure to compute tax liability; residential status and tax incidence.

Unit 2: Income under the head Salaries and House Property (12 hours)

Computation of income under the head salaries including various allowances and perquisites, computation of income of self-occupied and let out property.

Unit 3: Income under the head Profits and Gains of Business or Profession (6 hours)

Computation of income from business or profession, expenses specified and disallowed while computing such income.

Unit 4: Income under the head of Capital Gains and Other Sources (6 hours)

Meaning of capital assets, long term and short-term capital gains; computation of capital gains. Computation of taxable income from other sources.

Unit 5: Computation of Total Income and Tax Liability of an Individual (6 hours)

Clubbing of income; set off and carry forward of losses, permissible deductions under section 80C to 80U; Computation of taxable income and tax liability of an individual. **(On-line filing of Returns of Income and PAN Card).**

Practical Exercises: (30 hours)

The learners are required to:

1. Identify and educate the individuals not having PAN Card and help them understand the crucial relevance of holding a PAN Card. Help them in filling out the online application for the PAN Card and prepare the summarised report for the same.
2. Identify the relevance of various allowances and deductions in the present context and give a presentation for the same.
3. Identify and evaluate the tax liability of some individuals having income under different heads of income and present a case of the deductions and exemptions availed by each assessee.
4. Explore and attempt on-line filing of Returns of Income under ITR-1 and ITR-2. (Excel Utility)

Essential/recommended readings

- Ahuja, G., & Gupta, R. (2022). Simplified Approach to Income Tax. Flair Publications Pvt. Ltd., Delhi.
- Mittal, N. (2019). Concept Building Approach to Income Tax Law & Practice. Cengage Learning India Pvt. Ltd., Delhi.
- Singhania, V. K., & Singhania, M. (2022). Student's Guide to Income Tax. Taxmann Publications Pvt. Ltd., Delhi.

Suggested Resources:

- Income tax Act 1961
- www.incometaxindia.gov.in

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Generic Electives (GE):

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Integrative Biology	**4**	**3**	**0**	**1**	**PASS IN XII**	**NIL**

Learning Objectives

This course would make students understand the nature and evolution of genetic material and transfer of information in living systems. It will introduce the design of living systems.

Learning outcomes

After completion of the course the student will be able to;

- Comprehend current research in different streams of Biological Sciences
- Get in depth knowledge of how living system functions (regulation, communication)
- Know about different model system and their utilization in biology
- Apprehend study design in biology
- Get an idea of career prospects in bioscience

To design small innovative research projects in biosciences.

Syllabus

Unit I: Demystifying living state, Choice of the genetic material, RNA world, Evolution of DNA and Proteins **(15 hours)**

Unit II: Designing living systems, Nature of biological processes, Approaches to study Biology: Observational and Experimental, Synthetic cell and beyond **(15 hours)** Unit III: The regulated activities: Communication (external & internal) as the basis of regulation, Circuits and regulations in living systems, Interaction of biological components Model organisms in study of Biology **(15 hours)**

Practical Exercises: **(30 hours)**

- Isolation of DNA from bacteria and eukaryotic tissue and separation on agarose gel
- Isolation and separation of RNA from eukaryotic cells
- Isolation and separation of proteins from tissues and bacteria
- Evolution networks and cellular networks

References:

- An Introduction to Systems Biology: Design Principles of Biological Circuits, Uri Alon, Chapman & Hall, 2nd edition, 2013.
- Physical Biology of the Cell, Phillips et al., Garland Science, 2nd edition, 2012.
- Molecular Cell Biology, Lodish et al., W. H. Freeman & Company, 7th edition, 2012.
- Biochemistry, Berg, Tymoczko and Stryer, W H Freeman & Company, 7th edition, 2011.