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B. Tech. (IT & Mathematical Innovations)

Syllabus of Semester VIII

Semester VIII

Syllabus of Semester VIII (B.Tech. IT and Mathematical Innovation)

Discipline Specific Core Course

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		
Complex Analysis and Algebra DSC-20	4	3	1	0	12th Pass	Calculus, Linear Algebra

Learning Objectives

This interactive learning module intends to provide capabilities and basic understanding of complex analysis and algebra. The primary objective of this course is to introduce the basic tools of complex numbers, analytic functions, Laurent expansions and complex integration to understand their connection with the real-world problems. The second part of this course deals with introduction to group theory and its applications.

Learning outcomes

- Understanding the significance of limit, continuity and differentiability of complex numbers
- Evaluate integrals along a given path and functions.
- An introduction to the fundamentals of group theory
- Visualization of the applications of group theory

SYLLABUS

Unit I: Functions of complex variable - Derivatives, differentiation formulas - Cauchy-Riemann equations - sufficient conditions for differentiability - Analytic functions of a complex variable: Power- series expansions, Laurent expansions and Liouville's theorem.

(12 hours)

Unit II: Complex integration - Cauchy Integral Theorem - Residue Theorem and applications to evaluate real integral **(12 hours)**

Unit III: Sets, relations, functions - Groups, subgroups - Permutations – Cyclic notation of permutation – Even and odd permutations - Permutation groups – Alternating groups – Subgroups **(12 hours)**

Unit IV: Lagrange's theorem and its consequences – Cyclic and Abelian groups – Centralizer and normalizer of a group

(12 hours)

Essential/recommended readings

1. Complex Variables and Applications, J.W. Brown and R. V. Churchill, McGraw Hill (8th Edition), 2009.
2. Contemporary Abstract Algebra, J. A. Gallian, (8th Edition), Cengagae Learning, 2013.
3. An Introduction to Theory of Groups, J. J. Rotman,(4thEdition), Springer,1995.

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

DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE):

REDIT 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		
Computer Art and Design Techniques (DSE)	4	1	0	3	Class XII pass	Programming languages

Learning Objectives

This course provides an introduction to the principles of computer graphics. In particular, the course will consider methods for modeling 3-dimensional objects and efficiently generating photorealistic renderings on color raster graphics devices. The emphasis of the course will be placed on understanding how the various elements that underlie computer graphics (algebra, geometry, algorithms and data structures, optics, and photometry) interact in the design of graphics software systems.

Learning outcomes

After completing this course, student should be able to;

- Understand all Display devices and their background
- Understand and implement the Transformation algorithms
- Understand basics of Ray Tracing and shading.
- Understand the process of Camera and image formation and implementation

- Understand the concept of 2D and 3D transformation modeling
- have the basics of the Animations and Motion Pictures
- Have basic understanding of video databases and understanding indexing and retrieval of video.

Theory

Unit I: Basic Introduction, Overview of Graphics systems - Refreshing display devices, Random and raster scan display devices, Colour Models: RGB, HSV, etc., coordinates systems, Devices, plotters, Drawing techniques, projections, 2D & 3D Transformations, clipping, viewing curves and shading basics.

(15 hours)

Practice /LAB

Unit II: Implementation of DDA Line drawing algorithm, Bresenham's Line Drawing Algorithm, Midpoint circle algorithm, Mid-point Ellipse algorithms. Performing basic Transformation, Matrix representations, Composite Transformations, reflection and shear transformations.

(30 hours)

Unit III: Implementing Barky line clipping algorithm, Algorithm for polygon clipping, Sutherland-Hodgeman polygon clipping, Curves - Bezier Curves, 4 point and 5 point Bezier curves using Bernstein Polynomials **(30 hours)**

Unit IV: Perform Shading and Hidden Surface Removal - Shading, Guard Shading, Phong Model, Back Face Detection, Depth Buffer (Z-Buffer, A-Buffer) Method **(30 hours)**

Essential/recommended readings

1. Watt, Alan, 3D Computer Graphics. Addison-Wesley, 1999.
2. Shirley, Peter, Michael Ashikhmin, Steve Marschner, Fundamentals of Computer Graphics. 3rd ed. A K Peters/CRC Press, 2009.
3. The Illusion of Life – Disney Animations, Frank Thomas, Ollie Johnston, Walt Disney, 1981
4. Computer Graphics, C Version, 2nd Edition, Hearn & Baker, Pearson Education, 1997
5. Computer Graphics: Principles and Practice in C, 2nd Edition, J. Foley, Addison Wesley, 1995

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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		
Machine Learning for Business Intelligence (DSE)	4	1	0	3	Class XII pass	Programming languages, ML Basic Concepts

Learning Objectives

The course aims to leverage Data Analysis and Business Intelligence skills to help understand trends and derive actionable insights from data, thus allowing us to make data-driven, strategic and tactical business decisions.

Keywords: Data Analytics, Machine Learning, Management, Social Media, Business Intelligence

Learning Outcomes

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

- Develops business analytics foundation through machine learning for data analysis.
- Enhance their skills in data analysis, Python programming for machine learning and Python/ R programming for statistical methods.
- Find answers to the questions they don't know the answers to.
- Adapt to the automated future of business intelligence.

SYLLABUS

Unit I: Fundamentals of Data and Analytics, Overview of data types, sources, and collection methods for business applications, Basics of data analytics, Role of data in driving business intelligence and decision-making. (**8 hours**)

Unit II: Machine Learning for Business Intelligence: Introduction to machine learning concepts and algorithms for business, Building predictive and classification models for business decision support, Applications of machine learning in forecasting, optimisation, and customer insights. (**8 hours**)

Practical Component/Lab   **(90 hours)**

Unit III: Data Analytics for Business Functions: Applications in product strategy, sales, marketing, and consumer behaviour analysis.

- Collection of data from open business datasets (e.g., Kaggle, UCI) and perform data cleaning and preprocessing using Python (Pandas).
- Performing basic descriptive statistics and data visualisation to understand business trends.
- Using regression algorithms to predict future sales based on historical data.
- Applying classification models (e.g., Decision Trees, Logistic Regression) to segment customers.

Unit IV: Advanced Applications of Business Analytics:

Data analytics for digital and social media strategy, Innovation and entrepreneurship supported by analytics-driven insights.

- Forecasting product demand using time series data and ARIMA/exponential smoothing.
- Using association rule mining (Apriori algorithm) for cross-selling and product bundling. Performing customer segmentation using K-means clustering for targeted marketing.
- Analysing financial statements and building ML model to predict credit risk.
- Analysing social media to assess public sentiment towards a brand or product.
- Supply Chain Optimisation using Analytics through real-world problems

Essential/recommended readings

1. Sherman, R. (2014). Business intelligence guidebook: From data integration to analytics. Newnes.
2. Negash, S., & Gray, P. (2008). Business intelligence. *Handbook on decision support systems 2*, 175-193.
3. Moss, L. T., & Atre, S. (2003). Business intelligence roadmap: the complete project lifecycle for decision-support applications. Addison-Wesley Professional.
4. Chaudhuri, S., Dayal, U., & Narasayya, V. (2011). An overview of business intelligence technology. *Communications of the ACM*, *54*(8), 88-98.
5. Minelli, M., Chambers, M., & Dhiraj, A. (2013). *Big data, big analytics: emerging business intelligence and analytic trends for today's businesses* (Vol. 578). John Wiley & Sons.

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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		
Crafting Digital Experiences: A Practical Approach to Web Design and Programming (DSE)	4	0	0	4	Class XII pass	Database Management System, Data Communication and Networking

Learning Objectives

The objective is to introduce with the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

Learning outcomes

After completing this course, student should be able to;

· Acquire knowledge of web protocols and develop understanding of concepts of Internet security.

· Able to implement studied technologies in systematically developing a website with due regard to ethical and environmental issues.

· Understand the significance of emerging web technologies for the advancement of society.

Syllabus

Practice/Labs - (120 hours)

The course will be conducted completely in a hands-on mode and project-based learning. The following tasks will be covered in the lab:

• Exercise based on developing websites and portals using HTML.

• Exercise based on developing websites and portals using CSS.

• Exercise based on developing websites and portals using JavaScript.

• Projects based on PHP and MySQL to be implemented.

• Domains: Healthcare, Criminal, resource management projects, etc.

Essential/recommended readings

1. Data Communication and Networking, Forouzan, B.A., Tata McGraw-Hill. 2013

2. Internet and World Wide Web: How to Program, 5th Edition, Deitel and Deitel, Pearson Education. 2008

3. List of Web links prescribed by instructor

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DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE):

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		
Modeling Continuous Changes Through Partial Differential Equations (DSE)	4	3	1	0	Class XII pass	Ordinary differential equations

Learning Objectives

This course helps to develop Partial differential equation models, in the context of modeling heat and mass transport and, in particular, wave phenomena, such as sound and water waves. This course develops students' skills in the formulation; find a solution, understanding and interpretation of PDE models. As well as developing analytic solutions, this course establishes general structures and characterizations of PDEs. The course will also expose the students to various applications of the partial differential equations.

Learning outcomes

● Understand how partial differential equations (PDEs) represent real-world problems.
● Able to use computational tools to solve problems and applications of PDEs.
● Understand the importance of Laplace's equation, heat equation, wave equation, conduction of heat, gravitational potential, telegraph equation, dispersion of contaminants, Fourier series, Fourier transforms, etc. in the theory of PDEs.

Theory

Unit I: Familiarities with different type of first order linear and non-linear PDEs - Examples of PDEs arising in transport equation, conservation laws, spread of epidemic cholera - Cauchy problem for first order PDE   **(12 hours)**

Unit II: Method of characteristics, Classical methods for simple PDE models   **(12 hours)**

Unit III: Second order PDE arising in wave equations, conduction of heat, gravitational potential, telegraph equation, dispersion of contaminants - classification of second order PDE and their solution   **(12 hours)**

Unit IV: Fourier Series and Fourier transforms - Boundary Value Problem: Dirichlet and Neumann Problems   **(12 hours)**

Essential/recommended readings

1. *Partial Differential Equations*, E.DiBenedetto, Birkhauser, Boston,1995.
2. *Partial Differential Equations*,Fritz John,NarosaPubl.Co.,NewDelhi,1979.
3. *Linear Partial Differential Equation for Scientists and Engineers*, TynMyint-U and Lokenath Debnath, Springer, Indian reprint, 2006.
4. *Partial Differential Equations: An Introduction with Mathematica and MAPLE*, Ioannis P Stavroulakis and Stepan A Tersian, World Scientific, 2004

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DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE):

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		
Brain and Cognition: Computational Neurosciences (DSE)	4	1	0	3	12th Pass	**Understanding in Python, Networks**

This module is designed to:
- o Introduce students to the field of neuroscience
- o Introduce students to the components of Learning, Memory and Neuroplasticity
- o Differentiate between Neural Network and Artificial Neural Network
- o Understand Neurological Disorders, Neural Coding and Neuroimaging

- Learning outcomes
- After studying this course, the students will be able to:
  - o Comprehend Neural Network of the Brain and Artificial Neural Network
  - o Understand the different aspects of Neurosciences and its applications
  - o Develop knowledge about Neuroplasticity, Learning, Memory
  - o Understand Different Neurological Disorders, Phobia

SYLLABUS

Theory:

Unit I: Introduction to Neuroscience   **(15 hours)**

Introduction to Neurobiology; Brain, Synapse and Neurons; Gut-Brain Connection; Recent developments in Neurosciences

Practice/Labs/Projects:

Unit II: Networks (Neural, Artificial Networks)   **(30 hours)**

Networks and Patterns; Feedback and Feed Forward Loops; Artificial neural Network; Perceptrons, Multilayer Feed Forward Neural Networks; Neuro Dynamics

Unit III: Learning, Memory, Neuroplasticity   **(30 hours)**

Learning and Memory; Short term and Long term memory; Associative and Dissociative Learning; Memory based Learning, Neural plasticity; Cognitive and Neural modeling

Unit IV: Sleep, Neurological Disorders, Neural Imaging   **(30 hours)**

Different stages of sleep, Sleep Disorders, Coma; Phobia; Common NeurologicalDisorders; NeuroImaging, Functional Magnetic Resonance Imaging (fMRI), Computed Tomography (CT), Positron Emission Tomography (PET)

Essential/recommended readings

1. *Neuroscience: Exploring The Brain, Enhanced Edition*, Bear M et al., Jones and Bartlett Publishers, 2020.
2. *Fundamentals of Computational Neuroscience*, Thomas Trappenberg, Oxford University Press, 2010.

3. *Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems*, Peter Dayan and Larry Abbott, MIT Press, 2005.

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DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE):

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		
Systems Biology (DSE)	4	1	0	3	12th Pass	Network Biology, Python

Learning Objectives

This module is designed to:

- Develop an understanding of the biological equations and events as a whole and combines different streams of biosciences to get a bigger picture
- Explore cutting-edge technologies of biosciences to novel findings that travel to hitherto unexplored fields

Learning outcomes

After studying this course, the students will be able to:

- Comprehend biological networks and organization of biological systems
- Develop an understanding of designing simple organisms
- Perform biological data analysis, protein-protein interaction networks etc.

SYLLABUS

Unit I: Introduction to Systems Biology (9 hours)

Biological complexity, Biological circuits, Bio-physical properties of macromolecules, Biomolecular interaction analysis, Developmental biology, Data integration and hypothesis generation, Reversible reactions and feedback loops

Unit II: Network and Modelling (9 hours)

Transient networks, Behavioral networks, Cognitive and neural modelling, Memory and Learning, Neural models (vision, memory function, rhythm), Synapse and networks, Neural plasticity and computational learning, Artificial intelligence, Neural imaging

Practical components/Projects   **(90 hours)**

Interaction studies

Biological complexity, biological circuits - Biophysical properties of macromolecules - Biomolecular interaction analysis

1. Building Gene Regulation/Interaction networks models.
2. Intercellular signalling network analysis using relevant software's and data bases.
3. Creating biological databases and software.
4. Small projects integrating different biological parameters.

Essential/recommended readings

1. *An Introduction to Systems Biology: Design Principles of Biological Circuits*, Uri Alon, Chapman & Hall
2. *Fundamentals of Computational Neuroscience*, Thomas Trappenberg, Oxford University edition, 2010.
3. *Handbook of Systems Biology: Concepts and Insights*, Marian Walhout, Marc Vidal, Job Dekker (Edited), Academic Press; 1 edition, 2012.

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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		
Contribution of Indian Knowledge System to Science, Engineering and Technology	4	3	1	0	NIL	NIL

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)

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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; Zoonotic diseases, Pathogens (viruses, bacteria, parasites and fungi) and Infection Process, Epidemiology, Disaster Management, Biohazard and Bioweapons.

(15 hours)

Unit II: Medicine and Vaccine, Introduction to Drug Designing, Vaccine types, Clinical Trials, Trial Design, Personalized Medicine and Precision Medicine, Medical Terminology & Medical Ethics, Introduction to Public Health, Public Health Data Analysis, International Health Issues, Institutes of Public Health, Public health policy **(15 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 Essentials: From Basic Concepts to Tax Planning	4	3	0	1	PASS IN XII	NIL

Learning Objectives

This course seeks to offer an in-depth understanding of the different heads of income and emphasizes the calculation of an individual's total income and tax liability in accordance with the provisions of the Income Tax Act, 1961.

Learning outcomes

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

- Understand 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.

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; unrealized rent

Unit 3: Income under the head of Capital Gains and Other Sources   **(8 hours)**

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

Unit 4: Computation of Total Income and Tax Liability of an Individual, tax planning and management   **(16 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. Meaning of Tax Planning, Tax Avoidance and Tax Evasion. Different Aspects of Tax Management. Various Types of Return of Income, Belated and Revised Return. On-line filing of Returns of Income (ITR-1&2).

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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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.

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Outcome of the Academic Project/ Research Dissertation/ Entrepreneurship

At the end of the VIII semester the student is expected to achieve some of the following:

- An offer letter (from an industry)
- Extension of the internship (preferably paid)
- a publication in an internationally reputed journal such as Scopus-indexed/ SCI or equivalent indexed
- A policy document prepared
- Patent/prototype development
- Admission into higher education, such as a Master's program or Ph.D. program
- Any other outcome duly approved by the University