Course Description

Course Code	15B29CI891	**Semester** Even **(specify Odd/Even)**	**Semester** VIII **Session** 2023 -2024 **Month from** Jan to May 2024
Course Name	**Major Project Part – 2 (CSE)**		
Credits	8	**Contact Hours**	…

Faculty (Names)	**Coordinator(s)**	Prashant Kaushik, Dr. Himani Bansal
	Teacher(s) (Alphabetically)	Entire Department

COURSE OUTCOMES		**COGNITIVE LEVELS**
C451.1	**Summarize** the contemporary literature&tools for hands-on in the respective project area	Understand Level (Level 2)
C451.2	**Develop** a working model for the identified problem	Apply Level (Level 3)
C451.3	**Analyze** the specific requirements to develop the workable solution for the **identified** computing problem	Analyze Level (Level 4)
C451.4	**Evaluate** the developed solution using test cases and performances	Evaluate Level (Level 5)
C451.5	**Create** and **report** the results of the project in writtenformats	Create Level (Level 6)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	…	…	…
2.	…	…	…
...	…	…	…
***n*.**	…	…	…

Evaluation Criteria

Components	**Maximum Marks**
Mid Semester Viva	20
Final Viva	30
Project Report	20
Day to Day Work	30
Total	**100**

Project based learning: Each student in a group of 2-3 will have to develop a Major Project based on different real-world problems using any open-source programming language. Students have to study the state-of-the-art methods before finalizing the objectives. Project development will enhance the knowledge and employability of the students in IT sector.

Detailed Syllabus
Lecture-wise Breakup

Course Code	**16B1NHS831**	**Semester: EVEN (specify Odd/Even)**	**Semester: VIII Session** 2023 -2024 **Month: JAN 2024 –JUNE 2024**
Course Name	Gender Studies		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Prof Alka Sharma
	Teacher(s) (Alphabetically)	Prof Alka Sharma Shikha Kumari

COURSE OUTCOMES		**COGNITIVE LEVELS**
C401-19.1	Demonstrate knowledge of the construct of gender and the way itintersects with other social and cultural identities ofrace, class, ethnicity andsexuality	Understand(C2)
C401 - 19.2	Apply feminist and gender theory in an analysis of gender including an examination of the social construct of femininity andmasculinity	Apply (C3)
C401- 19.3	Analyze the ways in which societal institutions and power structures such as the family, workplace impact the material and social reality of women‟s lives	Analyze (C4)
C401-19.4	Assess the need for Gender Sensitization and Gender Inclusivity and its practice in contemporarysettings	Evaluate (C5)
C401- 19.5	Evaluate and interpret information from a variety of sources including print and electronic media, film, video and other information technologies	Evaluate (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	**Introducing Gender Issues**	• Sex andGender • Types ofGender • Gender Roles • Gender Division ofLabor • Gender Stereotyping and GenderDiscrimination	9
2.	**Gender Perspectives of Body & Language**	• Biological, Phenomenological and Socio-Cultural Perspectives ofbody • Body as a Site and Articulation of PowerRelations • Cultural Meaning of Female Body andWomen‟s Lived Experiences • The Other andObjectification	6
3.	**Social Construction of Femininity &Feminism**	• Bio-Social Perspective ofGender • Gender as AttributionalFact • Feminine &Feminist • Major Theorists of Feminism Challenging Cultural Notions of Femininity • Feminism Today: Radical, Liberal, Socialist, Cultural, Eco feminism & Cyberfeminism • Images of Women in Sports, Arts, Entertainment, Media and Fashion Industry ;Cultural Feminism&	9

		Celebrating Womanhood • Analysis of role women have played acrosscultures	
4.	**Social Construction of Masculinity**	• Definition and Understanding ofMasculinities • Sociology of Masculinity& itsTypes • Social Organization of Masculinity and Privileged Position ofMasculinity • Politics of Masculinity andPower • Major Theorists ofMasculinity • Masculine Identities in Literature, Cinema & Media.	9
5.	**Gender Sensitization Empowerment &Gender Inclusivity**	• Women & Women Rights InIndia • From Women's Studies to Gender Studies:A ParadigmShift • Gender Sensitization & Gender Inclusivity • Gender Studies & Media: Creating NewParadigms in Gender &Culture	9
		Total number of Lectures	**42**

Evaluation Criteria

Components	**MaximumMarks**
T1	20
T2	20
EndSemesterExamination	35
TA	25 (Project/ Assignment)
Total	**100**

Students will be given a project on the construction of gender and how does the major institution of the society have shaped their gender.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	Davis K., et al, "*Handbook of Gender and Women's Studies*. London: Sage. (2006)
2	Helgeson, Vicki S., "*The Psychology of Gender",* Pearson(2012)
3	Friedan B., "*The Feminine Mystique"*, Penguin. (1971/1992)
4	DebeauvoirS. , "*The Second Sex",* Vintage (1953/1997)
5	Wharton Amy S., "*The Sociology of Gender: An Introduction to Theory & Research*", Wiley-Blackwell (2005)
6	Pachauri G.," *Gender, School & Society*", R.Lall Publishers(2013)
7	Connell R.W, "*Masculinities*", Cambridge: Polity. (1985)
8	MacInnes J., "The *End of Masculinity"*. Buckingham: Open University Press. (1998)
9	Kaul A.& Singh M., *"New Paradigms for Gender Inclusivity*", PHI Pvt Ltd (2012)

Optimization Techniques (16B1NMA831)

Simplex method and variants, game theory, queuing models, inventory models, network scheduling, CPM and PERT, sequencing problems, discrete and continuous dynamic programming, nonlinear programming problems-numerical methods.

Course Description

Course Code	16B1NMA831	**Semester** Even	**Semester** VIII **Session** 2023-2024 **Month from** Jan 2024 to June 2024		
Course Name	Optimization Techniques				
Credits	3		**Contact Hours**	3-0-0	
Faculty (Names)	**Coordinator(s)**	Dr. Ram Surat Chauhan			
	Teacher(s) (Alphabetically)	Dr. Ram Surat Chauhan			

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C402-2.1	explain the basics of linear, dynamic and non-linear programming.	Understanding (C2)
C402-2.2	apply optimization techniques to solve problems related to linear programming, game theory, queuing and inventory models.	Applying (C3)
C402-2.3	analyze the problems related to dynamic programming, sensitivity analysis, sequencing and scheduling.	Analyzing (C4)
C402-2.4	determine numerical solutions of one dimensional and multidimensional nonlinear problems.	Evaluating (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Review of Linear Programming	Convex sets, Linear Programming Problems (LPP), graphical method, simplex method and its variants, revised simplex method, Duality theory, dual simplex method, sensitivity analysis.	08
2.	Game Theory	Rectangular Games, Minmax Theorem, Graphical Solution of 2×n, 3×n, m×2, m×3 and m×n Games, Solution of games using LPP technique.	06
3.	Queuing Theory & Inventory Model:	Introduction, Steady-State Solutions of Markovian Queuing Models: M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited waiting space. Inventory Models: Deterministic and Probabilistic models.	08
4.	Sequencing & Scheduling	Processing of Jobs through Machines: Processing of n jobs through two machines, two jobs through m machines and n jobs through m machines. Project Scheduling: Network diagram, Critical Path Method (CPM), Project Evaluation and Review Technique (PERT).	07

5.	Dynamic Programming	Discrete and Continuous Dynamic Programming: Bellman's principle of optimality, linear and nonlinear dynamic programming problems, Simple Illustrations.	06
6.	Nonlinear Programming	Unimodal function, One Dimensional minimization problem: Newton's method, Golden section method, Fibonacci search method, Bisection method. Multidimensional minimization problem: Steepest descent method, Multidimensional Newton's method.	07
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments)
Total	**100**

Project based learning: Each student in a group of 4-5 will collect literature on dynamic programming to solve some practical problems. To make the subject application based, the students analyze the optimized way to deal with aforementioned topic.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Taha, H. A., Operations Research - An Introduction, Tenth Edition, Pearson Education, 2017.
2.	Rao, S. S. - Engineering Optimization, Theory and Practice, Third Edition, New Age International Publishers, 2010.
3.	Hillier F., Lieberman G. J., Nag,B. and Basu, P., Introduction to Operations Research, 10th edition, McGraw-Hill, 2017.
4.	Wagner, H. M., Principles of Operations Research with Applications to Managerial Decisions, 2nd edition, Prentice Hall of India Pvt. Ltd., 1980.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12PH811	**Semester Even (specify Odd/Even)**	**Semester VIII Session** 2023 -2024 **Month from** January to June
Course Name	Photonics and Applications		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Navneet Kumar Sharma
	Teacher(s) (Alphabetically)	Navneet Kumar Sharma

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-3.1	Recalling the fundamental properties and the processes involved in the generation of light	Remember Level (C1)
C402-3.2	Thorough understanding of fiber optics and holography	Understand Level (C2)
C402-3.3	Ability to apply the fundamentals of various nonlinear optical effects in technology and interpret applications of photons	Apply Level (C3)
C402-3.4	Analysis of characteristics, trade-offs of optical detectors and modulators of light	Analyze Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Lasers	Review of different types of laser systems. LEDs, Semiconductor lasers, Quantum well lasers, Modes of laser cavity, Q-switching and Mode locking in lasers.	8
2.	Fiber Optics	Numerical aperture, Step and graded index multimode fibers, attenuation and dispersion, modes in optical fibers. Single mode fiber, mode cutoff and mode field diameter. Connector and splice losses, Erbium doped fiber amplifier and Characterization techniques including OTDR.	10
3.	Photo detectors	Semiconductor photo detectors.	5
4.	Optical Electronics	Wave propagation in anisotropic media, Electro-optic effect: phase and amplitude modulation. Acousto-optic effect: modulators, deflectors and tunable filters, Magneto-optic effect: modulators.	4
5.	Optical devices	Electro-optical device, Acousto-optical device, Magneto-optical device, Voice communication, Optical communication.	2
6.	Nonlinear Optics	SHG, Sum and Difference frequency generation, parametric amplification, wavelength converters, Self focusing with lasers.	6
7.	Holography	Recording and Reproduction of Hologram, Applications of holography.	4
8.	Applications of Photons in Memory devices	CD, VCD, DVD.	1
		Total number of Lectures	**40**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [Attendance (05 M), Class Test, Quizzes *etc* (06 M), Assignments in PBL mode (10 M) and Internal assessment (04 M)]
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	R. P. Khare, *Fiber Optics and Optoelectronics*, Oxford University Press.
2.	A. K. Ghatak and K. Thyagarajan, *Optical Electronics*, Cambridge university Press.
3.	A. K. Ghatak and K. Thyagarajan, *An Introduction to Fiber Optics*, Cambridge university Press.
4.	B. B. Laud, *Lasers and Nonlinear Optics*, New Age International.

Project based learning: Each student in a group of 4-5 students will opt a topic and will do the theoretical study in detail. The students will submit their report. To make the subject application based, the students analyze the optical fiber applications, holography applications and use of photons in memory devices. This shall improve the skills and employability of the students in laser and photonic industries.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12PH812	**Semester: Even**	**Semester: 8**, **Session :** 2023 -2024 **Month from: January to June**
Course Name	**Astrophysics**		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Prof. Anirban Pathak
	Teacher(s) (Alphabetically)	Anirban Pathak

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Relate historical development of astrophysics with the modern concepts and recall the mathematical techniques used & definition of different units	Remembering (C1)
CO2	Explain the models of universe, ideas of stellar astrophysics, life cycles of stars, physical principles that rules galaxies, and general theory of relativity	Understanding (C2)
CO3	Apply mathematical principles and laws of physics to solve problems related to astrophysical systems	Applying (C3)
CO4	Compare different models of universe and decide which one is logically acceptable and why	Analyzing (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1	Introduction to Astrophysics	Historical development of astrophysics (from mythology to contemporary astrophysics), Mass, length and time scales in astrophysics, sources of astronomical information (effect of discovery of spectroscopes and photography), astronomy in different bands of electromagnetic radiation (e.g. Optical astronomy, infra-red astronomy radio astronomy, X-ray astronomy. Gamma-ray astronomy etc. with specific mention of Hubble space telescope). Kirchoff's law, Doppler effect and Hubble's law.	**8**
2.	Stellar Astrophysics	Classification and nomenclature of stars. Basic equations of stellar structure, main sequence, red giants and white dwarfs, HR diagram, stellar evolution, supernovae, extra solar planets.	**8**
3.	Death of a star	End states of stellar collapse: degeneracy pressure of a Fermi gas, structure of white dwarfs, Chandrasekhar mass limit, neutron stars pulsars and black holes.	**6**
4.	Our galaxy	The shape and size of Milky way and its interstellar mater	**2**
5.	Extragalactic astrophysics	Normal galaxies, active galaxies, cluster of galaxies, large-scale distribution of galaxies.	**6**
6.	GTR and Models of Universe	Qualitative idea of general theory of relativity (without using tensor calculus) and its implications. Different models of universe. Specific attention to the ideas	**6**

		related to big bang, cosmological constants, dark matter and dark energy.	
7.	Astrobiology	Drake equation and related questions.	**2**
8.	Conclusion	Review of the present status of Astrophysics and open questions.	**2**
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25
	(a) Quizes /class tests (06 M), (b) Attendance (05 M) (c) Internal Assessment (04) (d) Assignments in PBL mode (10 M)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Astrophysics for Physicists, Arnab Rai Choudhuri, Cambridge University Press, Delhi, 2010.
2.	Astrophysics: Stars and Galaxies, K D Abhyankar, University Press, Hyderabad, 2009.
3.	Facts and Speculations in Cosmology, J V Narlikar and G Burbidge, Cambridge University Press, Delhi, 2009.
4.	The Cosmic Century, Malcolm Longair, Cambridge University Press, Cambridge, 2006.
5.	An Introduction to Astrophysics, Baidyanath Basu, Prentice Hall of India, Delhi 1997.
6.	Fundamentals of Equations of State, S. Eliezer, A Ghatak and Heinrich Hora, World Scientific, Singapore, 2002. Only Chapter 15.

Project based learning: Project report (5-7 pages in pdf format indicating Name, Enroll No. and Batch) is to be uploaded in google class room before starting of End Term Exam. Max 5 students can work on one topic given in the list (Dark Matter, Dark Energy, Expanding Space time, Merger of Black holes, Failed stars, Detection of Gravitational Waves, Light cone in GTR, Particle production radiation era, Did big bang happened ?, Discover life: ET etc.**), however, they may prepare different reports. Report should include introduction, definition, mathematics, principle, working, figures, applications etc.**

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12PH814	**Semester: Even**	**Semester:** VIII **Session:** 2023 -2024 **Month: January to June**
Course Name	Plasma Physics		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Dr. Anuraj Panwar
	Teacher(s)	Dr. Anuraj Panwar

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-34.1	Define terminology and concepts of plasma physics with various natural phenomena and engineering applications.	Remembering Level (C1)
C402-34.2	Summarize plasma and explain its electric, magnetic, dielectric and thermal properties.	Understand Level (C2)
C402-34.3	Develop magneto-hydrodynamic fluid and kinetic models to explain various phenomena taking place in homogeneous, isotropic and anisotropic plasma conditions.	Apply Level (C3)
C402-34.4	Analyze and formulate mathematical / analytical expressions for various nonlinear processes in plasmas.	Analyze Level (C4)
C402-34.5	Evaluate physical problems, estimate their numerical solutions and draw inferences from the results.	Evaluate Level (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	**Introduction to the Plasma State**	Elementary concepts, definition of temperature Debye Shielding, plasma parameters, applications of Plasma Physics, Production of Plasmas in the laboratory, Drifts of charged particles under the effect of different combinations of electric and magnetic fields and Mirror Machine.	10
2.	**Fluid description of plasmas**	Relations of Plasma Physics to ordinary electromagnetics, dielectric constant of a plasma, collisions, equation of continuity, macroscopic parameters of plasma, two and one fluid equations for plasma.	04
3.	**Nonlinear Waves in Plasmas**	Plasma oscillations, space charge waves of warm plasma, ion-acoustic waves and electromagnetic waves in magnetized plasma.	08
4.	**Diffusion and Resistivity**	Decay of Plasma by diffusion, diffusion across a magnetic field, single fluid MHD equations, Diffusion in fully ionized Plasmas, Bohm diffusion and Neoclassical diffusion.	06
5.	**Stability of fluid plasma**	The equilibrium of plasma, classification of plasma instabilities, stability analysis: Two stream instability and Gravitational instability or Rayleigh Taylor instability (Plasma supported against gravity by magnetic field).	04
6.	**Nonlinear effects**	Ponderomotive force, Parametric instabilities, decay instability, two plasmon decay, stimulated Raman scattering and stimulated Brillouin scattering, non linear Landau damping.	06
7.	**Controlled thermo-nuclear fusion**	Magnetic and inertial confinement schemes, ITER, TOKAMAK.	02
		Total number of Lectures	**40**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz+PBL+Attendance+class performance)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Textbooks, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	F. F. Chen., *Introduction to Plasma Physics*, Springer (2016).
2.	Krall and Trievelpiece, *Principles of Plasma Physics*, McGraw-Hill (1973).
3.	W. L. Kruer, *The Physics of laser plasma interactions*, Addison Wesley (1988).
4.	Liu and Tripathi, *Interaction of electromagnetic waves with electron beams and plasmas*, World Scientific (1994).

Project based Learning (PBL): Students groups may be formed to submit project reports on natural and engineering applications of plasma physics. Students may be asked to make presentations on topics like mirror machine, plasma diffusion, Raman scattering and plasma fusion devices. Students may be asked to present recent published articles on plasma applications. Students may be asked to solve plasma physics problems by using their expertise computer language

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12PH813	**Semester: EVEN**	**Semester: VIII Session** 2023 -2024 **Month from: January to June**
Course Name	Bio-Physics		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Prof Papia Chowdhury
	Teacher(s) (Alphabetically)	Prof Papia Chowdhury

S.N.	DESCRIPTION	COGNITIVE LEVEL (BLOOMS TAXONOMY)
C402-5.1	Find the connections between physics and biology of living system, Physical processes in the living organisms	Remember (C1)
C402-5.2	Understand the idea of DNA computing with the construction of different DNA logic gates.	Understanding (C2)
C402-5.3	Apply the idea of different radiation sources to explain radiobiology to understand the effect of radiation on living system	Apply (C3)
C402-5.4	Analyzing the working of different bio-devices: Organic semiconductor, solar cell, OLED, PLED, AMOLED, biosensors.	Analyze (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Biophysics and DNA computation	Connections between physics and biology of living system, Physical processes in the living organisms. The need of study of physical processes in biological systems. Introduction to DNA computing, DNA structure, Hamiltonian path problem, Encoding information in DNA, Biooperations, DNA models of computation, DNA algorithms, Error rates in DNA computing DNA logic gates, Identity, NOT, OR, AND, NAND, XOR, HALF ADDER, FULL ADDER DNA logic gates, truth table, Technology of tic-tac toe game by DNA computation	14
2.	Radiation Biophysics	Atomic structure models: Constituents of atomic nuclei, Isotope, Radioactivity, Ionizing radiation, excitation, radiation sources, Alfa, Beta, Gamma rays, Properties of Electromagnetic radiation, Units of radioactivity, Particle flux, X & Gamma ray interaction with matter, Energy transfer processes, Nonionising radiation, Radiobiology: Radiolysis, Production of free radicals & their interactions, Radiation on living system, productions of radionuclides, Radio tracer techniques, Radio sensitisation and protection, Target theory, Cellular effects of radiation, Radiation damage, Genetic Effect of radiolysis, Early and late effects of radiation, Effect of Chronic exposure to radiation,	10

		Radiation detection, measurement and applications: Principles of radiation detection and measurement, Dosimeters and its Principles, Design & Working.	
3.	Photo Biophysics	Light sources, Molecular structure and excited states, Physical properties of excited molecules, Photophysical processes, fluorescence, phosphorescence, Internal conversion, Intersystem crossing, Optical activity, Photophysical kinetics of bimolecular processes. Optical bio-devices in electronic industry-Organic semiconductor, solar cell, OLED, PLED, AMOLED etc. Alternative energy sources-Hydrogen fuel cell.	6
4.	Bio-sensing systems	Piezoelectric and Luminescent biosensors, Theory, reaction, design and applications; Quantum dots: dimension, exciton, excited bohr radius, colour coding by quantum dots, experimental techniques for trapping quantum dots by micellization.	7
5.	Environmental biophysics	Ozone umbrella, green house effect, global warming.	3
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz (6M), Attendance (5M), project (10M), Class performance (4 M)]
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Biophysics, an Introduction, Rodney M. J. Cotterill, John Wiley & Sons.
2.	Methods in modern Biophysics, Bengt Nölting, Springer International Edition.
3.	Biophysics. Vasantha Pattabhi, N. Gautham, Narosa Publishing House.
4.	Biophysics. Hoppe W., Lohmann W., Mark H., and Zeigler H. M.(1983) Biophysics, Springer Verlag, Heidelberg.
5.	Conformation of Biological Molecules, Govil G. and Hosur R.V. (1982), Springer Verlag, Berlin, Heidelberg, New York.

Project based Learning (PBL): In whole Biophysics course applications of physics in biology have been discussed. The course also deals with the working of fundamental biophysical techniques depending on their applicability in Industry like sensors, OLED, AMOLED, DNA Logic gates, drug designing etc. Throughout the course Students will make some individual projects on selected Topics of application of Biophysics on todays biomedical and electronic industry. Students will also do some project work on drug designing. Example: For drug designing different software based techniques are used like molecular docking, MD simulation etc., piezoelectric materials are used for the making of biosensors, optical sensors, viewers which are applied in defense purpose and in medical science. Each project work will describe the detail about the specific applied field. Students will take help from available internet sources, current research papers, Text books for preparing the project. Throughout the preparation of the whole project and by presenting the project work students will gather deep learning about the applicability of Biophysics for the requirement of current medical and electronic Industry. The overall knowledge will help them to prepare themselves as an efficient Engineer according to the requirements of current Industry.

Multi Attribute Decision Making (20B12MA411)

Basic Steps in Decision Analysis, Decision-Making Environments, Decision Making Under Uncertainty, Decision Making Under Risk, Utility Theory, Decision Tree. GDM Methods, Content-Oriented Methods, and Disadvantages of Non ranked Voting, Preferential Voting System, and Social Choice Functions. Multiattribute Decision Making, Multi Objective Decision Making, Decision Making Process, Structuring Process, Decision Matrix, Attributes, Normalization, Attribute Weight Assignment Methods. Dominance Relation method, Even-Swap method, Lexicographic method Maximax method, Maximin method, Conjunctive method, Disjunctive method, Median Ranking, Analytic Hierarchy Process, Analytic Network Process. Multi Attribute Value Theory, Simple Additive Weighting, Weighted Product, TOPSIS Outranking Methods.

Course Description

Course Code	20B12MA411	**Semester-** Even	**Semester VIII Session** 2023 -2024 **Month from** Jan 2024 to June 2024	
Course Name	**Multi Attribute Decision Making**			
Credits	3		**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Pankaj Kumar Srivastava and Dr. Dinesh C. S. Bisht		
	Teacher(s) (Alphabetically)	Dr. Dinesh C. S. Bisht and Dr. Pankaj Kumar Srivastava		

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above-mentioned course, the students will be able to:		
C402-6.1	explain the concepts of decision analysis and decision-making.	Understanding (C2)
C402-6.2	develop the concept of group and multi criteria in decision making problems.	Applying (C3)
C402-6.3	categorize decision making approaches to handle multi attribute problems.	Analyzing (C4)
C402-6.4	estimate value and outranking based methods in decision making problems.	Evaluating (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Decision Analysis	Basic Steps in Decision Analysis, Decision-Making Environments, Decision Making Under Uncertainty, Decision Making Under Risk, Utility Theory, Decision Tree.	8
2.	Group Decision Making	GDM Methods, Content-Oriented Methods, and Disadvantages of Non ranked Voting, Preferential Voting System, and Social Choice Functions.	7
3.	Multicriteria Decision Making	Multiattribute Decision Making, Multi Objective Decision Making, Decision Making Process, Structuring Process, Decision Matrix, Attributes, Normalization, Attribute Weight Assignment Methods.	8

4.	Elementary Methods for MADM	Dominance Relation method, Even-Swap method, Lexicographic method Maximax method, Maximin method, Conjunctive method, Disjunctive method, Median Ranking, Analytic Hierarchy Process, Analytic Network Process.	8
5	Value Based and Outranking Methods	Multi Attribute Value Theory, Simple Additive Weighting, Weighted Product, TOPSIS Outranking Methods.	11
		Total number of Lectures	**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz and Assignments)
Total	**100**

Project Based Learning: Students will be divided in a group of 4-5 to collect literature and submit a report on estimation of value and outranking based methods in decision making problems.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Ishizaka, Alessio, and Philippe Nemery. *Multi-criteria decision analysis: methods and software*. John Wiley & Sons, 2013.
2.	Xu, Zeshui. *Uncertain multi-attribute decision making: Methods and applications*. Springer, 2015.
3.	Tzeng, Gwo-Hshiung, and Jih-Jeng Huang. "Multi Attribute Decision Making: Methods and Applications." *USA, CRC Press.* 2016.

Detailed Syllabus
Lecture-wise Breakup

Course Code	21B12EC413	**Semester** Even **(specify Odd/Even)**	**Semester** 8th **Session** 2023-24 **Month** from January-May
Course Name	Solar Engineering		
Credits	3	**Contact Hours**	3L

Faculty (Names)	**Coordinator(s)**	Nisha

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-37.1	Recall the basic concepts of Solar Energy and Global Energy Needs for Solar Engineering	Remembering Level (C1)
C402-37.2	Interpret the Physics of the Sun and Its Energy Transport.	Understanding Level (C2)
C402-37.3	Implement solar thermal and electrical system for performance estimation	Applying Level(C3)
C402-37.4	Differentiate Solar Water-Heating Systems for Commercial/Industrial Applications	Analyzing Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1**.**	Introduction to Solar Energy Conversion	Introduction , Environmental Characteristics, Heat transfer concept, Heat Transfer coefficient, Optimization of Heat Losses, Thermal analysis and effect of environment with economic analysis	5
2	Fundamentals of Solar Radiation	The Physics of the Sun and Its Energy Transport, Thermal Radiation Fundamentals, Sun–Earth Geometric Relationship, Extraterrestrial Solar Radiation, Estimation of Terrestrial Solar Radiation, Models Based on Long-Term Measured Horizontal Solar Radiation and Measurement of Solar Radiation	8
3.	Solar Engineering-I: Electrical Aspect	Solar Cell materials, Single crystal solar cell or solar grade, Types of Solar Energy Collectors, Performance of Solar Collectors, Photovoltaic Systems, Design and Modeling of Solar Systems, Solar Energy Analysis	10
4.	Solar Engineering-II: Thermal Aspect	Solar Thermal Power Systems, PVT air/water collectors performance, design and modeling, Thermodynamic Power Cycles, Design of Parabolic Trough–Based Power Plants, Parabolic Dish Systems, Central Receiver Tower Systems	10
5.	Solar Heating Systems and other applications	Solar Water-Heating Systems, Solar Space Heating and Cooling, Industrial Process Heat, Solar Dryers, Solar Desalination Systems, Solar Cooling and Dehumidification and applications of Solar Energy in Electronics and communication engineering Commercial/Industrial Applications	10
		Total number of Lectures	43

Evaluation Criteria

Components **Maximum Marks**

T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Attendance & Quiz)
Total	**100**

Project based learning: Students will review and prepare report on any one of the discussed application of solar energy. They can implement solar thermal and electrical system for performance estimation.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	G.N. Tiwari, Solar Energy : fundamentals, Design, Modelling and applications. Narosa Publishing House, 2016.
2.	Chetan Singh Solanki, Solar Photovoltaics: Fundamental, technologies and applications. Prentice Hall of India, 2015
3.	James Momoh, Smart Grid: Fundamentals of Design and Analysis, Wiley-IEEE Press, 2012.
4	Juan Bisquert, The Physics of Solar Cell, CRC Press, Taylor & Francis group, 2018

Detailed syllabus
Lecture-wise Breakup

Subject Code	**21B12HS411**	**Semester: EVEN**	**Semester 2nd Session 2023-24 Month from Jan to June**
Subject Name	**URBAN SOCIOLOGY**		
Credits	**3**	**Contact Hours**	**3-0-0**
Faculty (Names)	**Coordinator(s)**	**Dr Yogita Naruka**	
	Teacher(s) (Alphabetically)	**Dr Yogita Naruka**	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C401 - 25.1	Understand the concepts and theories of urban sociology	Understanding Level (C2)
C401 – 25.2	Apply and analytical framework to understand the structural characteristics of cities students are residing in	Applying Level (C3)
C401 – 25.3	Analyze the role of agencies and actors in shaping the process of urbanization	Analyse Level (C4)
C401 – 25.4	Evaluate importance of good governance and urban planning	Evaluating Level (C5)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Introduction to Urban Sociology	Basic Concepts and terminologies of the urban sociology, Origin of urban societies, Rural-Urban Continuum	**2**
2.	Theories of Urban Sociology	The classical theories – Simmel, Weber, Tonnies, Louis Wirth, Durkheim & Engels; Ecological Theories – Chicago School, Concentric Zone theory, Sector theory, Multiple Nuclei theory	**5**
3.	Contemporary Urban Processes	Industrialisation, Colonialism, Class-Conflict theories (Marxism), Neo-liberalism	**5**
4.	Urbanisation in India	Development of urban sociology in India, Evolution of urban structures, Spatial Structures and Classification of cities	**4**
5.	Urban Planning	Concept of urban planning – History, need and relevance, Principles of Urban planning, Urban	**7**

		planning in India – Agencies and Stakeholders, Strategies and techniques of urban planning – Social area analysis, mapping and zoning, role of cooperatives	
6.	Urban Governance	Urban governance – Concept and need, Urban Governance in India, Urban decentralization – agencies and role of local bodies	**4**
7.	Urban Issues in India	Urban Poverty, Informality & Exclusion, Urban Environment Lessons from Pandemic	**4**
8.	Technology and urbanisation	Smart cities, Case studies of smart cities and use of digital technologies in urban	**5**
9.	Sustainable urban Development	Sustainable urban development – concept, need, tenets and strategies Sustainable development goals (SDGs) in relation to urban	**4**
10.	Global perspectives on urban	Neo-liberalism and urban, Globalization and urban, Emergence of megacities	**5**
Total number of Hours			**45**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Assignment/Quiz)
Total	**100**

Project Based Learning: The students would be divided into a group of 4-5. They would be asked to map and discuss the different parts of their cities. The lectures and readings on the process of urbanization and models of urbanization will form the basis for this exercise. Students would be required to critically analyse the urban spaces using sociological perspectives and theories. The students would be needed to make a presentation and also submit a report.

Recommended Reading material:

1.	Gottdiener, M., Budd, L., &Lehtovuori, P. *Key concepts in urban studies*. Sage. (2015)
2.	Lin Jan and Mele Christopher, ed. *The Urban Sociology Reader*. London: Routledge. (2005)
3.	Rao, M. S. A., ed. *Urban Sociology in India: Reader and Source Book*. New Delhi: Orient Longman. (1974)
4.	Savage, M., and Warde, A. *Urban sociology, capitalism and modernity*. Macmillan International Higher Education. (1993)
5.	Sivaramakrishnan, K.C., Kundu, Amitabh & Singh, B.N. *Handbook of Urbanization in India*. Oxford University Press (2007)

6.	Wirth, Louis. *Urbanism as a Way of Life*. American Journal of Sociology. (1938)
7.	Sharma, A.K. and Misra, B.D. *Urbanization in India: Issues &Challenges.*New Delhi: Ane Books Pvt. Ltd.(2018)

Course Description

Subject Code	22B12CS412	**Semester: Even 2024**	**Semester**: 8th **Session:** 2023 -2024 **Month from:** January to June 2024
Subject Name	Digital Forensics and Cyber Laws		
Credits	**3-0-0**	**Contact Hours**	**3**

Faculty (Names)	**Coordinator(s)**	Dr. Kapil Madan (62), Ms. Anuradha Gupta (128)
	Teacher(s) (Alphabetically)	Ms. Anuradha Gupta (128), Dr. Kapil Madan (62)

After the completion of the course, Students are able to

COURSE OUTCOMES		**COGNITIVE LEVELS**
C433-8.1	Summarize the concepts and categories of cybercrimes.	Understand Level (C2)
C433-8.2	Explain the different forms of digital forensic investigation methodology.	Understand Level (C2)
C433-8.3	Make use of digital evidence collection guidelines.	Apply Level (C3)
C433-8.4	Solve cybercrime cases with respect to Indian cyber laws and ITAct.	Apply Level (C3)
C433-8.5	Examine the various digital forensic tools in real-time scenarios.	Analyse Level (C4)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to Cybercrime	Introduction, Role of Electronic Communication Devices and Information and Communication Technologies in Cybercrime, Types of Cybercrime, Classification of Cybercriminals, Tools used in Cybercrime, Challenges to Cybercrime, Strategies to Prevent Cybercrimes	**05**
2.	Cyber warfare and cyber laws	Introduction to Cyber War, Ransomware ,Types of Ransomware, Mode of Infection , Events in Ransomware Attack , Role of Antivirus Deep Web and Dark Web, Accessing Dark Web, Onion Router—TOR, Introduction to Cyber Laws, Cyber Laws in India and Case Studies, Information Technology Act 2000, Amendments to the Indian Evidence Act 1872 in View of Information Technology Act 2000	**06**
3	Introduction to Digital Forensics	Computer Forensics Investigations , Steps in Forensic Investigation ,Forensic Examination Process , Methods Employed in Forensic Analysis, Forensics classification, Incident and Incident Handling, Disk, Network, Database, Wireless, Malware, Mobile, GPS, Email, Memory forensics, Incident and Incident handling	**06**
4	Digital Evidence	Digital Evidence, Evidence Collection Procedure, Acquisition and Handling of Digital Evidence, from different digital devices, Operating Systems and their Boot Processes ,Storage Medium , File System, Windows Registry, Windows Artefacts , Browser Artefacts, Linux Artefacts ,Whole Disk Encryption or Full Disk Encryption, Evidence from Mobile Devices, Digital Evidence on the Internet, Challenges with Digital Evidence	**06**
5	Acquisition and Handling of	Preliminaries of Electronic or Digital Evidence, Acquisition and Seizure of Evidence, Chain of Custody, Acquisition of Computer and Electronic Evidence, Acquisition Procedure using Target Disk Mode from Apple	**06**

	Digital Evidence	Macintosh Computer, Mobile Phone and PDA, Optical and Removable Media, Digital Cameras, Handling of Digital Evidence	
6	Analysis of Digital Evidence	Introduction ,Capturing of Forensic Copy of Memory and Hard Drive with Toolkit Forensic Imager , RAM Analysis with Volatility ,Analysing Hard Drive, Working with Autopsy, Email Tracking and Tracing	**06**
7	Forensic Tools	Forensic Tools,Types Cyber Forensic Suite, Free and Open-source Forensic Suite, Proprietary Forensic Suites, Drive Imaging andValidation Tools, Forensic Tool for Integrity Verification and Hashing ,Forensic Tools for Data Recovery, Forensic Tools for RAM Analysis Registry Analysis, Encryption/Decryption, Password Recovery, Network Analysis, Forensic Utility for Metadata Processing UNIX System Analysis	**07**
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
T3	35
TA	25 (Attendance-05, Class Assignment/ Quiz-10, Project Based Learning - 10)
Total	100

Project Based Learning: The students are grouped into groups of size 2-3 and will be implementing various cyber forensics tools. The student will analyze the requirements and select the required applications. This will help in the employability of students in the cyber security and forensics based industry and public sectors.

	Text Books:
1.	Cyber Forensics by Murugan, S, Oxford University Press.
2	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole andSunit Belpure, Publication Wiley.
	Reference Books:
1.	Cybercrime and Digital Forensics: An Introduction by Thomas J. Holt , Adam M. Bossler, Kathryn C. Seigfried-Spellar, Routledge; 2nd edition, 2017
2.	Digital Forensics and Incident Response: A practical guide to deploying digital forensic techniques in response to cyber security incidents by Gerard Johansen, Packt Publishing Limited, 2017
3	The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics by John Sammons, Syngress; 2nd edition, 2014

Detailed Syllabus
Lecture-wise Breakup

Course Code	22B12CS413	**Semester:** EVEN	**Semester** 8th **Session** 2023-2024 **Month**: Jan. 2024 to May 2024
Course Name	Data Analytics using R and Python		
Credits	3	**Contact Hours**	**3-0-0**
NBA Code	C433-9		

Faculty (Names)	**Coordinator(s)**	Dr. Bhawna Saxena (J62) & Dr. Vartika Puri (J128)
	Teacher(s) (Alphabetically)	Dr. Bhawna Saxena (J62) & Dr. Vartika Puri (J128)

COURSE OUTCOMES At the completion of the course, students will be able to		**COGNITIVE LEVELS**
C433-9.1	Explain the fundamental concepts of data analytics.	Understand (Level 2)
C433-9.2	Demonstrate the concepts of R & Python for data analytics.	Apply (Level 3)
C433-9.3	Apply advanced methods and their quantitative analysis for real-world problems.	Apply (Level 3)
C433-9.4	Apply statistical methods for hypothesis testing and inference problems.	Apply (Level 3)
C433-9.5	Analyze, visualize and interpret the results for useful insights.	Analyze (Level 4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Data Definitions and Analytical Programming Techniques	Introduction to Data Analytics, Elements, Variables, and Data categorization, Levels of Measurement, Introduction to analytical programming languages R & Python, and Installing Software & Setting up, Lists & Dictionaries, Functions & Packages, Data frame, Import and Export data, Data Preprocessing.	10
2.	Parametric & Non-Parametric Tests	Hypothesis Testing, Assumption Testing, T-Test, Power Analysis, ANOVA, Fitting ANOVA Model in Python & R, Wilcoxon Tests, Mann-Whitney U Test	6
3.	Correlation & Association Analysis	Pearson Correlation, Spearman Correlation, Kendall Tau Correlation, Affinity Analysis & Market Basket Analysis, APriori Algorithm, Association Rules, Frequent Pattern Analysis	7
4.	Data Analysis Techniques	Introduction to Machine Learning, Applications of ML Library in R & Python for Supervised & Unsupervised Learning, Basic Neural Network, Transfer Function Models, Multivariate Time Series Analysis.	10

5.	Decision Making & Data Visualization	Introduction to decision system, Bayesian Theory, Fuzzy Logic, building a simple decision system based on Bayesian Theory & Fuzzy Logic, Plotting with R & Python Libraries	5
6.	Model Evaluation Techniques	Model Evaluation Measures for Classification Task, Decision Cost/ Benefit Analysis, Rationale for measuring Cluster Goodness, Silhoutte Method	4
		Total number of Lectures	**42**

Project based learning:

Each student in a group of 3-4 has to work on a mini-project, in which they will identify a real-life problem and develop the solution by utilizing skills learned throughout the course. The project implementation should be in python or R preferably along with well documentation on different aspects of the software. This enhances the understanding of students towards different concepts of data analytics and also helps them during their employability as data engineer or data analyst.

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance (5 Marks), Quiz / Mini-Project/Assignment (20 Marks))
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Text Book(s)

1.	Navlani, A., Fandango, A. and Idris, I. (2021). Python Data Analysis – Third Ed. Packt Publishing Ltd.
2.	Jake vander Plas, Python Data Science Handbook – Essential Tools for Working with Data, O'Really Media, 2022
3.	David J. Pine, Introduction to Python for Science and Engineering, CRC Press, 2019.
4.	Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of Hypotheses, PHI, 2014.
5.	Kabacoff, Robert I. R in action: data analysis and graphics with R. Simon and Schuster, 2015.
6.	Haider, M. (2015). Getting Started with Data Science: Making Sense of Data with Analytics. IBM Press.

Reference Books

1.	Doing Data Science, Straight Talk from The Frontline, Cathy O'Neil and Rachel Schutt, O'Reilly (2014).
2.	Robert Johansson, Numerical Python – Scientific Computing and Data Science Applications with NumPy, SciPy and Matplotlib, Apress, 2019
3.	Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016
4.	Nelli, F., Python Data Analytics: with Pandas, NumPy and Matplotlib, Apress, 2018.
5.	Wickham, H., &Grolemund, G. (2016). R for data science: import, tidy, transform, visualize, and model data. " O'Reilly Media, Inc.".

Detailed Syllabus
Lecture-wise Breakup

Course Code	22B12CS414	Semester Even (specify Odd/Even)	Semester: 8th Session 2023 -2024 Month from January to June
Course Name	Agile Software Development Process		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr Ashish Singh Parihar (J62), Mr. Pankaj Mishra (J128)
	Teacher(s) (Alphabetically)	Dr.Ashish Singh Parihar, Prof. Chetna Gupta, Mr. Pankaj Mishra

COURSE OUTCOMES		COGNITIVE LEVELS
C433-10.1	Interpret the trade-offs between traditional and agile software development methods.	Understand level (Level 2)
C433-10.2	Apply appropriate agile software engineering approach for a software development.	Apply Level (Level3)
C433-10.3	Apply appropriate tools for testing agile projects using various testing strategies	Apply Level (Level3)
C433-10.4	Apply refactoring techniques on source code for improved design	Apply level (Level3)
C433-10.5	Estimation and monitoring of agile projects.	Analyze level (level4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures
1.	Introduction	Traditional software development methods, Introduction to Agile software development methods and Agile development Frameworks. Lean software development	3
2.	Agile Fundamentals	Agile manifesto, Agile principles, Characteristics of Agile processes, an iterative development process, Pros and cons of incremental development and software prototyping.	3
3.	Scrum Framework	Introduction, Scrum - Prioritizing, Estimating, and Planning, The Scrum Experience (hands-on exercise)	5
4.	Extreme Programming (XP)	Extreme Programming Values, Principles and Practices, Pair programming, Embracing change, incremental change	5
5.	Crystal Framework	Crystal methodologies: project categories, complexity, family members, Crystal's seven properties, Crystal clear development process cycle, Crystal yellow, crystal orange and crystal orange web.	4
6.	Kanban Framework	The principles of Kanban, Improving process with kanban, Measure and manage flow, Emergent behavior	4
7.	Feature-Driven Development	Processes of feature driven development, practices and progress in FDD	2
8.	Refactoring in Agile	Bad smells in code, properties of refactoring, refactoring examples, benefits, cost and risk of refactoring	7
9.	Agile Testing	Agile testing strategy, Agile test plan, automated unit test, test driven development (TDD), alpha, beta and acceptance testing.	5

		Exploratory testing.	
10.	Estimation and Monitoring of Agile Projects	Agile estimation, Story point estimation, Sprint velocity estimation, team capacity, Planning and controlling agile projects.	4
		Total number of Lectures	42

Evaluation Criteria

Components	Maximum Marks
T1	20
T1	20
End Semester Examination	35
TA	25 Attendance (10) + Quiz (10)+ PBL (5)
Total	100

Project based learning: Each student in a group of 3-4 have to work on a mini-project, in which they will identify a real-life problem and develop the solution by applying their knowledge of search-based software engineering approach. The project implementation can be in any programming language preferably along with well documentation on different aspects of the software. It enhances the understanding of students towards different concepts of search-based software engineering approach and also helps them during their employability.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Shore, J., & Warden, S. (2021). *The art of agile development*. O'Reilly Media, Inc.
2.	Merkow, M. (2019). *Secure, resilient, and agile software development*. CRC Press.
3.	Martin, R. C. (2019). *Clean agile: back to basics*. Pearson Education.
4.	Stellman, A., & Greene, J. (2014) *Learning agile: Understanding scrum, XP, lean, and kanban*. O'Reilly Media, Inc.

Recommended Reference material:

1.	Santos, P.M., Consolaro, M. & Di Gioia, A.(2019). *Agile Technical Practices Distilled: A learning journey in technical practices and principles of software design*. Packt Publishing Limited.
2.	Goodpasture, J. C. (2015). *Project management the agile way: Making it work in the enterprise*. J. Ross Publishing.

Course Description
EVEN 2024
22B12CS415 – AI in Healthcare and Smart Systems

Course Code	22B12CS415	**Semester: EVEN**	**Semester:** 8th **Session:** 2023-24 **Month:** January - June 2024
Course Name	Artificial Intelligence in Healthcare and Smart Systems		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator**	Dr. Suma Dawn
	Teacher(s)	Dr. Suma Dawn

COURSE OUTCOMES		**COGNITIVE LEVELS**
C433-7.1	Interpret the fundamental concepts of AI in Healthcare Industry and Medical Waste Management	Understand Level (Level 2)
C433-7.2	Demonstrate AI usage for EHR Data including prescription, diagnostics, and pathology reports.	Apply Level (Level 3)
C433-7.3	Emulating Gamification of physiotherapy/ behavioral change therapy using AR/VR-based immersive technologies	Apply Level (Level 3)
C433-7.4	Analyze AI for Medical Imaging Data	Analyze Level (Level 4)
C433-7.5	Examine the use of AI for Wearable Device Data	Analyze Level (Level 4)

No.	**Title of the Module**	**Topics in the Module**	**CO Mapping**	**No. of Lectures for the module**
1.	Introduction	AI introduction; Connection of AI with Healthcare; Use and Applications of AI for healthcare problems;	**CO1**	2
2.	Model Architectures	Basics of Model architectures, Open Source APIs for Model designing, Classification Models – KNN, Neural Networks (Perceptron, Feed Forward, and Backpropagation), Segmentation – K-means, FCM, and Hierarchical models, Regression and Prediction Models	**CO1**	6
3.	EHR Data Analysis	Analyze EHR datasets to check for common issues (data leakage, statistical properties, missing values, high cardinality) by performing exploratory data analysis; Group and categorize data within EHR datasets using code sets; Create derived features (bucketing, cross-features, embeddings) utilizing TensorFlow feature columns on both continuous and categorical input features, Evaluate, and Interpreting Models.	**CO2**	8
4.	Medical Image Analysis	AI for Medical Imaging and its relevancy, 2D and 3D medical imaging modalities and their clinical applications, machine learning algorithms for medical	**CO4**	12

		imaging; Statistically assess an algorithm's performance, Translating AI Algorithms for Clinical Settings, Medical Imaging, and Exploratory Data Analysis		
5.	Wearable Devices	Introduction to Sensors; Activity Classification; ECG/EEG Signal Processing; Smartwatches for monitoring;	**CO5**	6
6.	AR/VR-based Immersive Technology	Behavioral Change therapy using immersive technology; Gamification of Physiotherapy	**CO3**	4
7.	Waste Management in Healthcare Domain	Understanding the carbon footprint of medical wastes; AI-based medical waste management procedures	**CO1**	4
		Total number of Lectures		**42**

	Evaluation Criteria **Components** **Maximum Marks** T1 Examination 20 T2 Examination 20 End Semester Examination 35 TA 25 (Attendance (5), Assignments/Quiz/Class-Test (10), Mini Project (10)) **Total** **100**
	Project-Based Learning: Students in groups of 3-4 will take a real-world problem and apply AI logic to solve the healthcare problem in a meaningful way. Students would be able to understand the core logic of data handling and processing, apply concepts, and propose a method for solving a relevant problem.

Recommended Reading material:	
No.	**Books:**
1.	Andrew Nguyen**,** Hands-On Healthcare Data**,** Publisher(s): O'Reilly Media, Inc., Released August 2022
2.	Kerrie L. Holley, Siupo Becker, AI-First Healthcare, Publisher(s): O'Reilly Media, Inc., Released April 2021
3.	Jason Burke, Health Analytics: Gaining the Insights to Transform Health Care, John Wiley & Sons, 2015
4.	Adam Bohr, & Kaveh Memarzadeh, Artificial Intelligence in Healthcare, Elsevier Science, 2020
5.	Mandeep Singh, Introduction to Biomedical Instrumentation, PHI Publishing House, Second Edition 2016.
6.	World Health Organization, Safe management of wastes from health-care activities, 2nd ed., World Health Organization 2014.
7.	Walter Greenleaf, *Applied Virtual Reality in Healthcare: Case Studies and Perspectives,* 2023

8.	Raymond Kai-Yu Tong, Wearable Technology in Medicine and Health Care, Academic Press, 2018
9.	Rohit Raja, Sandeep Kumar, Shilpa Rani, K. Ramya Laxmi, Artificial Intelligence and Machine Learning in 2D/3D Medical Image Processing, CRC Press, 2021
	Sites:
1.	https://www.ncbi.nlm.nih.gov/
2.	Artificial Intelligence in Medicine, https://www.sciencedirect.com/journal/artificial-intelligence-in-medicine
3.	Artificial Intelligence in Healthcare https://www.mdpi.com/topics/artificial_intelligence_healthcare
4.	

Detailed Syllabus

Lecture-wise Breakup

Course Code	**22B12CS418**	**Semester** EVEN **(specify Odd/Even)**	**Semester** VIII **Session** 2023 -2024 **Month from** Jan -June
Course Name	Unmanned Aerial Vehicles: Design Principles and Applications		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Hema N
	Teacher(s) (Alphabetically)	Dr. Hema N

COURSE OUTCOMES		**COGNITIVE LEVELS**
C432.1	Explain types and characteristics of UAVs and their applications.	Understand (L2)
C432.2	Assess design requirements and tools to develop different UAVs.	Apply (L3)
C432.3	Identify and analyze the components, sensors and payload of UAVs, their navigation and guidance.	Analyze (L4)
C432.4	Analyze UAV Architectures and communication choices for selected case studies.	Analyze (L4)
C432.5	Development of small drone based applications and simulation of UAVs using open source autopilot systems.	Create (L6)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Introductions to UAVs; past , current and future of UAVs; Regulations bodies; UAV Classifications'- Military ,Civilian and customized Unmanned Aircraft; Review of a Few Successful UAVs	02
2.	Design Fundamentals	Introduction , Design Project Planning, Decision Making, Design Process, Systems Engineering, UAV Conceptual Design, UAV Preliminary Design, UAV Detail Design, Design Review, Evaluation.	04

3.	UAV Preliminary Design	Introduction, Maximum Takeoff Weight Estimation, Weight Buildup, Payload Weight, Autopilot Weight, Fuel Weight, Battery Weight, Empty Weight, Wing and Engine Sizing, Quad-copter Configuration.	04
4.	Design Disciplines	Introduction , Aerodynamic Design , Structural Design , Propulsion System Design, Landing Gear Design, Mechanical and Power Transmission Systems Design , Electric Systems, Control Surfaces Design, Safety Analysis , Installation Guidelines.	04
5.	Aerodynamic Design	Introduction, Fundamentals of Aerodynamics, Wing Design, Tail Design, Vertical Tail Design, Fuselage Design, Antenna, Aerodynamic Design of Quad-copters, Aerodynamic Design Guidelines	03
6.	Control System Design	Introduction ,Basics of Autopilot Design, Fundamentals of Control Systems, Servo/Actuator , Flight Control Requirements, Control Modes, Controller Design, Autonomy, Manned–Unmanned Aircraft Teaming, Control System Design Process.	04
7.	Guidance and Navigation System Design	Introduction, Fundamentals of Guidance System Design, Law of Guidance: Command, PN, Pursuit and Waypoint, Sense and Avoid, Formation Flight, Motion Planning and Trajectory Design, Guidance Sensor, Guidance System Design. Navigation System Design and Classifications, Coordinate Systems, Inertial Navigation System, Kalman Filtering, Global Positioning System, Position Fixing Navigation, Navigation in Reduced Visibility Conditions, Inertial Navigation Sensors, Navigation Disturbances, Navigation System Design.	05
8.	UAV Architectures	Introduction, Distributed Hybrid, Deliberative/Reactive Architecture, Classification of Multi-UAV Architectures, Operator Interaction with Centralized Versus Decentralized UAV Architectures through case studies	03
9.	UAV Microcontroller	Introduction, Basic Fundamentals, Microcontroller Circuitry, Embedded Systems, Microcontroller Programming, Programming in C and Arduino, Open-Source Commercial Autopilots, Design Procedure, Design Project	03
10.	Ground Control Station and Payloads Design	Introduction, GCS Subsystems, Types of Ground Stations, GCS of a Number of UAVs, GCS Design Guidelines. Elements of Payload, Payloads of a Few UAVs, Cargo or Freight Payload, Reconnaissance/Surveillance Payload , Scientific Payloads, Military Payloads, Electronic Counter Measure Payloads, Payload Installation, Payload Control and Management, Payload Selection/Design Guidelines.	05

11.	UAV Communications System Design	Fundamentals, Data Link, Transmitter, Receiver, Antenna, Radio Frequency, Encryption, Communications Systems of a Few UAVs, Installation, Communications System Design, Bi-directional Communications using Arduino Boards.	03
12.	UAV applications	Reconnaissance and intelligence gathering, forest patrol, coastline monitoring, search and rescue, Health care system, border patrol, fire monitoring, target search and destroy, pipeline monitoring, communication relay, data mule	02
		Total number of Lectures	**42**

Project Based Learning: Each student in a group of 3-4 will choose a real-life application area to build UAV using ArduPilot open source autopilot system. ArduPilot is a trusted, versatile, and open source autopilot system supporting many vehicle types: multi-copters, traditional helicopters, fixed wing aircraft, boats, submarines, rovers and more. ArduPilot enables the creation and use of trusted, autonomous, unmanned vehicle systems for the peaceful benefit of all. ArduPilot provides a comprehensive suite of tools suitable for almost any vehicle and application.

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance =10, Class Test or/and Quizzes, etc = 05, Assignments in PBL mode = 10).
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

Text Books:

1.	Sadraey, M. (2017). Unmanned aircraft design: A review of fundamentals. *Synthesis Lectures on Mechanical Engineering*, *1*(2), i-193.
2.	Jha, A. R. Theory, design, and applications of unmanned aerial vehicles. CRC Press, 2016.

Reference:

1.	Valavanis, K. P., & Vachtsevanos, G. J. (Eds.). (2015). Handbook of unmanned aerial vehicles (Vol. 1). Dordrecht: Springer Netherlands.
2.	Lin, Ching-Fang. MODERN NAVIGATION, GUIDANCE, AND CONTROL PROCESSING. 1991.
3.	Austin, Reg. *Unmanned aircraft systems: UAVS design, development and deployment*. John Wiley & Sons, 2011.

4.	Unmanned Aircraft Systems : UAVs Design Development and Deployment by Reg Austin
5.	Keane, Andrew J., András Sóbester, and James P. Scanlan. *Small unmanned fixed-wing aircraft design: a practical approach*. John Wiley & Sons, 2017.
6.	https://onlinecourses.nptel.ac.in/noc21_ae13/preview
7.	https://www.coursera.org/learn/robotics-flight#syllabus

Detailed Syllabus
Lecture-wise Breakup

Course Code	22B12CS420	**Semester Even (specify Odd/Even)**	**Semester:VIIIth Session** 2023 -2024 **Month : January to May**
Course Name	Software Construction using Kubernetes & Microservices		
Credits	**4**	**Contact Hours**	**3-0-0**

Faculty (Names)	**Coordinator(s)**	Dr. Anubhuti, Dr.Amarjeet Prajapati
	Teacher(s) (Alphabetically)	Dr. Anubhuti, Dr.Amarjeet Prajapati

COURSE OUTCOMES		**COGNITIVE LEVELS**
C434-6.1	Understand the Devops practices and the complete delivery pipeline using Jenkins.	Understand Level (Level 2)
C434-6.2	Applying the version control system through platform like Git and GitHub	Apply Level (3)
C434-6.3	Compare different microservices, domain drivers and design patterns.	Analyze Level (Level4)
C434-6.4	Evaluating security and test strategies for microservices using access tokens and test principles.	Evaluate Level (Level 5)
C434-6.5	Evaluate containerization concepts through kubectl commands and pod concepts.	Evaluate Level (Level5)
C434-6.6	Create application using Kubernetes with controllers and load balancers.	Create Level (Level6)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to DevOps	Why DevOps, DevOps Stages, Continuos Integration (CI), Continuos Delivery (CD) and Continuons Deployment (CDep), Continuos monitoring, DevOps Tool support.	6
2.	Jenkins and CI/CD pipeline, Git Commands	Introduction to Jenkins (With Architecture) Jenkins Management, Adding a slave nodeto Jenkins Building Delivery Pipeline,Github and Git commands.	6
3.	Why microservices	Monolithic architecture, microservices architecture, service-oriented architecture (SOA), REST architecture, Inter process Communication, microservice transaction management	6
4.	Microservices Design	Microservices design patterns, domain driver design, designing small microservices, designing independent microservices,	6
5.	Microservices security and testing	Importance of security in microservices, microservices security principles and techniques, access tokens, testing strategy for microservices, testing at different levels for microservices.	6
6.	Kubernetes	Kubernetes core concepts, kubectl commands, Pods concepts, configuring cluster nodes	6

	fundamentals		
7.	Kubernetes implementation	Kubernetes services and controllers, load balancing and deployment, configuringkubernetesscheduler, deploying an application using dashboard	6
		Total number of Lectures	42

Evaluation Criteria

T1:20

T2:20

T3:35

TA: 25 (Attendance-5, quizzes-6, assignments-5, Project-9)

Total :100

Project based learning: Each student in a group of 4-5 will select an application and will create the entire DevOps process. They will learn to work with tools and technologies such as Docker, Git, Kubernetes, Microservices and Jenkins. DevOps is currently all the rage and the demand for DevOps engineers are high. With a lot of companies focusing on reducing the operational time and costs, DevOps has become an important factor. Working on the project enhances the student's knowledge on of new world data applications and helps in enhancing their employability into related sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Davis, Jennifer.Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale. OriellyPublication. 1st edition. 2016
2.	Gene, Kim. The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win. IT Revolution USA. 3rd edition. 2016
3.	Newman, Sam. Building Microservices: Designing Fine-Grained Systems. OOrielly Publication. 1st edition. 2016
4.	Baier Jonathan. The complete kubernetes guide. Packt publishing house, Ist edition. 2019

Detailed Syllabus
Lecture-wise Breakup

Subject Code	22B12CS422	**Semester: Even**	**Semester** VIII **Session** 2023 -2024 **Month from:** Jan 2024 to June 2024
Subject Name	Cloud computing essentials: Azure and AWS		
Credits	**3**	**Contact Hours**	**3-0-0**

Faculty (Names)	**Coordinator(s)**	Deepti Singh (J62), Astha Singh (J128)
	Teacher(s) (Alphabetically)	Deepti Singh, Astha Singh

COURSE OUTCOMES		**COGNITIVE LEVELS**
C434-7.1	Recall the fundamentals of Cloud Computing, its applicability and architecture.	Remember (level 1)
C434-7.2	Understand the architecture and services of AWS (Amazon Web Services), Azure and Google Cloud platforms.	Understand (level 2)
C434-7.3	Apply the AWS, Azure and Google cloud platform to solve the real-world problems.	Apply (level 3)
C434-7.4	Analyze the AWS, Azure and Google cloud platform to solve the real-world problems	Analyze (level 4)
C434-7.5	Create the applications using appropriate cloud platforms.	Create (level 5)

Module No.	**Subtitle of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Overview of Cloud Computing	Origin of Cloud Computing, Benefits and challenges, Parallel and distributed computing, Grids and HPCs, Data center design and management for clouds, Virtualization: Why virtualization, Benefits and shortcomings, comparison with cloud, Software Defined Networks and Storage (SDN and SDS) Cloud Computing Architecture: IaaS, PaaS, SaaS, Types of cloud, Interoperability and its challenges, Cloud security, stability and fault tolerance methods and challenges, Applications for cloud, Clouds for different applications, Service Level Agreements, Concurrent, high-throughput and data intensive computing	10

2.	AWS Essentials	Introduction to Amazon Web Services, EC2: Compute services, Networking, infrastructure and reliability, Storage and database services, Amazon Elastic Block Store (Amazon EBS), Amazon Simple Storage Service (Amazon S3), Amazon Elastic File System (Amazon EFS), Amazon Relational Database Service (Amazon RDS), Amazon virtual private cloud (VPC), Identity and Access Management (IAM) and Security on AWS.	8
3.	Azure Essentials	Azure core concepts, Azure services, Describe core solutions and management tools on Azure, Describe general security and network security features, Describe identity, governance, privacy, and compliance features, Describe Azure cost management and service level agreements.	8
4.	GCP Essentials	Google Cloud Fundamentals: Core Infrastructure-Google App Engine, Google Compute Engine, Google Kubernetes Engine, Google Cloud Storage, Google Cloud SQL, and BigQuery. Google Cloud Resource Manager hierarchy and Google Cloud Identity and Access Management , Essential Google Cloud Infrastructure: Foundation, Essential Google Cloud Infrastructure: Core Services, Elastic Google Cloud Infrastructure: Scaling and Automation, Reliable Google Cloud Infrastructure: Design and Process	8
5.	Recent trends, Cloud Platforms Comparison & Project based learning	Serverless computing, Microservices, Usage of containers and Dockers, Kubernetes, Comparing the services and efficiency of AWS, Azure and GCP with respect to resource management. Discussing and Implementing a few web applications and system applications on the cloud platforms under different resource management scenarios. Analyzing and evaluating the platforms based on various parameters like security, load balancing, fault tolerance, resilience, cost-effectiveness, etc.	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance (10), Mini-Project (10),Assignments (5))
Total	**100**

Project based learning: Groups of 2-3 students will choose a project topic. They will use the concepts of cloud technology to execute their project. In a team, they will learn how to apply the concepts for problem solving in a meaningful way. The knowledge gained will enhance their employability in the IT sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

	Text Books
1.	Buyya, Rajkumar et al. "Cloud Computing Principles and Paradigms." Wiley, 2011.
2.	Reagan, Rob. "Web Applications on Azure." *Apress*, 2017
3.	Moyer, Christopher M.. "Building Applications in the Cloud: Concepts, Patterns, and Projects." Pearson Education, 2011.

4.	Wilkins, Mark. “Learning Amazon web services (AWS): a hands-on guide to the fundamentals of AWS cloud”. Addison-Wesley Professional, 2019
	Reference Books
5	Sosinsky, Barrie A.. “Cloud Computing Bible.” (2010).
6.	Pace, Eugenio et al. “Developing Applications for the Cloud on the Microsoft Windows Azure Platform.” (2010).
7	Reese, George. “Cloud Application Architectures - Building Applications and Infrastructure in the Cloud.” (2009).
8	Diaz, Francesco and Roberto Freato. “Cloud Data Design, Orchestration, and Management Using Microsoft Azure.” *Apress* (2018).

Detailed Syllabus

Course Code	15B1NHS832	**Semester** Even **(specify Odd/Even)**	**Semester** VIII **Session** 2021-2022 **Month from** Feb-June
Course Name	International Studies		
Credits	3	**Contact Hours**	**3(3-0-0)**

Faculty (Names)	**Coordinator(s)**	Dr. Chandrima Chaudhuri
	Teacher(s) (Alphabetically)	Dr. Chandrima Chaudhuri

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C402-8.1	Demonstrate an understanding of the basic concepts in the area of international studies	Understanding (C2)
C402-8.2	Compare the changes in India's foreign policy in the Cold War era and the post Cold War era	Applying (C3)
C402-8.3	Analyze the major political developments and events since the 20th century	Analyzing (C4)
C402-8.4	Demonstrate an understanding of the rise of new power centres in the changing world order	Understanding (C2)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Basic Concepts	Balance of power and Collective security National Interest and its instruments	4
2.	An Overview of Twentieth Century International Relations History	World War I: Causes and Consequences Significance of the Bolshevik Revolution Rise of Fascism / Nazism World War II: Causes and Consequences	8
3.	Cold War Politics	Origin of the Cold War Evolution of the Cold War Collapse of the Soviet Union Causes of the End of the Cold War	8
4.	India's foreign policy during the Cold War era	Basic Determinants (Historical, Geo-Political, Economic, Domestic and Strategic) India's Policy of Non-alignment	6
5.	India's foreign policy in the Post-Cold War era	India and SAARC India and the Look East policy Impediments to regional co-operation: river water disputes; illegal cross-border migration; ethnic conflicts and insurgencies; border disputes	8
6.	Emergence of Other Power Centres	European Union Rise of Asia Powers- Russia, China and Japan	8
		Total number of Lectures	**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Project/ Quiz/Attendance)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	A. Chatterjee, *International Relations Today*. Noida, India: Pearson, 2019
2.	Appadorai, & M.S.Rajan, *India's Foreign Policy and Relations*. New Delhi, India: South Asian Publisher, 1985
3.	E.H. Carr, *International Relations between the Two World Wars: 1919-1939*. New York, USA: Palgrave, 2009
4.	J. Baylis &S. Smith, Ed. *The Globalization of World Politics: An Introduction to International Relations*. Oxford, UK: Oxford University Press, 2011
5.	P. Calvocoressi, *World Politics: 1945—2000*. Essex, UK: Pearson,2009

Project Based Learning: Each student would form a group of 3-4 and submit projects on India's foreign policy and rise of new power centres. This project would help the students' research about the India's relations- economic, political and diplomatic and also consider a variety of perspectives and interpretations of current world events.