Detailed Syllabus

Course Code	15B1NHS832	**Semester Even (specify Odd/Even)**	**Semester VIII Session** 2023-2024 **Month from Feb**-June 2023
Course Name	International Studies		
Credits	3	**Contact Hours**	**3(3-0-0)**

Faculty (Names)	**Coordinator(s)**	Dr. Ila Joshi/ Dr Gaurika Chugh
	Teacher(s) (Alphabetically)	Dr. Gaurika Chugh/ Ila Joshi

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**

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.

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
6.	P.Zelikow, *The Road less travelled: The secret battle to end the great war,1916-17*. New York, USA: Public Affairs, 2021
7.	R,Cooper, *The Ambassadors: thinking about diplomacy from Machiavelli to modern times*. London,UK: Weidenfeld & Nicolson, 2021

Detailed Syllabus
Lecture-wise Breakup

Course Code	**16B1NHS831**	**Semester: Odd (specify Odd/Even)**	**Semester: VIII Session** 2022 -2023 **Month: JAN 2023 –JUNE 2023**
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 has 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)

Detailed Syllabus
Lecture-wise Breakup

Subject Code	**17B1NHS732**	**Semester: Even**	**Semester: 8th** **Session: 2022 -2023** **Month: January to June**
Subject Name	**INDIAN FINANCIAL SYSTEM**		
Credits	**3**	**Contact Hours**	**3 (3-0-0)**

Faculty (Names)	**Coordinator(s)**	1. Dr. Mukta Mani (Sec 62) 2. Dr Sakshi Varshney (Sec 128)
	Teacher(s) (Alphabetically)	2. Dr Mukta Mani 2. Dr Sakshi Varshney

NBA Code	Course Outcomes	Cognitive Level
C402-31.1	Understand the interlinkage of components of the financial system and financial instruments of the Money market and Capital market.	C2
C402-31.2	Analyze ways of fundraising in domestic and international markets	C4
C402-31.3	Understand the functioning of the Stock market and evaluate securities for investment.	C5
C402-31.4	Apply the knowledge of Mutual Funds and Insurance in personal investment decisions	C3
C402-31.5	Apply knowledge of Income tax for the calculation of the tax liability of an individual.	C3

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Hours**
1.	Introduction	Meaning, Importance, and functions of Financial system. Informal and Formal financial systems, Financial markets, Financial Institutions, Financial Services and Financial instrument	3
2.	Money Market	Features of money market Instruments: Treasury bills, commercial bills, commercial papers, certificates of deposit, call and notice money, Functions of money market, Linking of money market with Monetary policy in India	3
3.	Capital Market	Features of Capital market instruments: Equity shares, Bonds. Fundraising through Initial Public Offering, Rights issue, Preferential allotment and Private Placement. Process of IPO-Intermediaries in IPO, Book building process and allotment of shares	3

4.	Foreign investments in India	Fundraising from the foreign market through Foreign direct investment and foreign institutional investment, ADR, GDR, ECB, and Private equity.	3
5.	Stock Market	Trading in the secondary market- Stock exchanges, regulations, demutualization, broker, a listing of securities, dematerialization, trading, short selling, circuit breaker, stock market indices- methods of calculation of indices.	3
6.	Stock Valuation and Analysis	Investing basics: Consideration of Risk and Return, Stock Valuation and Analysis- Fundamental analysis: Economy, industry and company analysis; Technical Analysis of stocks using technical charts	7
7.	Investing in Mutual Funds and Insurance	Mutual Funds: Basics, Types of funds, risk and return considerations in the selection of funds; Insurance: Basics, Life insurance and health insurance, types of policies	6
8.	Overview of Income Tax	Basics of Income tax Concept of the previous year, assessment year, person, income. Calculation of Income tax liability for individuals: Income from salaries- basic, DA, HRA, leave salary, Gratuity, Pension, Allowances and Perquisites; Income from Capital Gain, Deductions under sections 80C to 80U.	14
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Class participation and Attendance)
Total	**100**

Project-Based Learning: The students will form groups of 4-5 students. They will carry out a stock analysis of a selected company on the basis of fundamental and technical analysis techniques studied in lecture classes. Finally, they will give their recommendation about the performance of the stock.

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

1	Pathak Bharti V, *Indian Financial System*, 5th Edition, Pearson Education, 2018
2	Madura Jeff, *Personal Finance*, 6th Ed, Pearson Education, 2017.
3	Machiraju H R, *Indian Financial System*, 5th Ed, Vikas Publication, 2019

4	Bhole L M and Mahakud, J., *Financial Institutions and Markets*, 5th ed. Tata McGraw Hill Publication, 2017.
5	Singhania & Singhania, Students Guide to Income Tax, 67th Edition, Taxmann Publication, August 2022.
6	*How to Stimulate the Economy Essay* [Online]Available: https://www.bartleby.com/essay/How-to-Stimulate-the-Economy-FKJP5QGATC
7	Reserve Bank of India, 'Money Kumar & the Monetary Policy', 2007
8	Ashiwini Kumar,Sharma,' De-jargoned: Book building process, Live Mint,2015.
9	Madhavan, N. "Pushing the accelerator instead of brakes: Can Subhiksha make a comeback?", Business Today, 28th June 2009.
10	Kaul, Vivek, "Master Move: How Dhirubhai Ambani turned the tables on the Kolkata bear cartel", The Economic Times, July 1, 2011.

Course Description

Subject Code	**18B12HS815**	**Semester Even**	**Semester** VIII **Session 2022-23** **Month from** Jan to June 2023
Subject Name	**QUALITY ISSUES IN ENGINEERING**		
Credits	3 (3-0-0)	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Akarsh Arora
	Teacher(s) (Alphabetically)	Dr. Akarsh Arora

COURSE OUTCOMES		**COGNITIVE LEVELS**
C402-32.1	Apply the concepts of quality within quality management systems by understanding various perspectives, historical evolution; and contributions of key gurus in the field of quality	Apply Level (C3)
C402-32.2	Determine the effectiveness of acceptance sampling using single and double sampling plans and operating characteristic curves	Evaluate Level (C5)
C402-32.3	Determine quality by employing a wide range of basic quality tools, lean concepts and process improvement techniques such quality function deployment	Evaluate Level (C5)
C402-32.4	Examine the importance of six sigma, various quality standards, awards, certifications	Analyze Level (C4)

Module No.	**Subtitle Of The Module**	**Topics In The Module**	**No. Of Lectures For The Module**
1.	Fundamentals And Evolution Of Quality	Introduction, Dimensions Of Quality, Fundamentals, History Of TQM, Contemporary Influences	6
2.	Quality Tools And The Improvement Cycle	Various Costs, Juran's Coq Accounting Statement, Voice Of Customers: Kano's Model, House Of Quality, QFD Process, Seven Tools For Quality Management	9
3.	Benchmarking	Meaning, Process, Methods	3
4.	Quality Gurus	Contribution of Quality Gurus	3
5.	Six Sigma	Six Sigma, Capability Of A Process/Product/Service, DMAIC Process	6
6.	Lean Concepts	Kaizen, Poka-Yoke, Andon, Kanban, JIT, 5-S, 7 Mudas	3
7.	Statistical Thinking And Applications	Statistical Process Control, Acceptance Sampling, Specification And Control Limits, Control Charts For Variables, Control Charts For Attributes	6

8.	Quality Awards And Certifications	MBNQA, RGNQA, Deming Prize, ISO Standards	3
9.	Quality Strategy For Indian Industry	India's Quality Journey, Quality Management In India	3
Total Number Of Lectures			42

Project-based Learning: Students are required to visit any business organization to observe the brief about the organization; its products; its suppliers; its operations; its processes, Quality control system and techniques followed by the company, Quality standards met by the company, application of quality tools or lean manufacturing system, Sigma capability of products or processes, DMAIC methodology, application and relevance of the quality concepts studied in the course. Collecting information on quality systems, quality standards, quality certifications or awards received, and sigma capability will upgrade students' knowledge and strengthen their skills to tackle multiple quality engineering issues along with employability.

Evaluation Criteria

Components	**Maximum Marks**
T1	20 (Written)
T2	20 (Written)
End Term	35 (Written)
TA	25 (Project Assignment, Quiz)
Total	**100**

Recommended Reading material:

1.	Besterfield D. H., Besterfield-Michna C., Besterfield G. H., Besterfield-Sacre M. *Total quality management*, Prentice Hall, 1999.
2.	Evans, J. R., Dean J. W. *Total quality management, organization and strategy*, Thomson, 2003. 399 p.
3.	Kanji G. K., Asher M. *100 Methods for Total Quality Management*. London: SAGE Publications, 1996.
4.	Oakland G. F. *Total Quality Management*, Oxford, 1995.
5.	Goetsch D. L., Davis S. B. *Quality management. Introduction to TQM for production, processing and services*. New Jersey: Prentice Hall, 2003.
6.	John S. Oakland. *Total Quality Management and Operational Excellence*: Text with cases, Fourth edition, 2014
7.	Dale H. Besterfield. *Total Quality Management*, (Revised Edition). India: Pearson, 2011.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12PH811	**Semester Even (specify Odd/Even)**	**Semester VIII Session** 2022 -2023 **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	Recall the fundamental properties of light and the processes involved in the generation of light	Remember Level (C1)
C402-3.2	Interpret the theory of fiber optics	Understand Level (C2)
C402-3.3	Apply the fundamentals of various nonlinear optical effects in technology; make use of holography and its applications	Apply Level (C3)
C402-3.4	Compare the operational principles, characteristics and 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 :** 2022 -2023 **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 (05 M),
(b) Attendance (05 M)
(c) Internal Assessment (05)
(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:** 2022 -2023 **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

Multi Attribute Decision Making (20B12MA411)

Course Code	**20B12MA411**	**Semester** Even	**Semester VIII Session** 2022 -2023 **Month from** Jan 2023 to June 2023
Course Name	**Multi Attribute Decision Making**		
Credits	3	**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Dinesh C. S. Bisht	
	Teacher(s) (Alphabetically)	Dr. Dinesh C. S. Bisht	

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
CO-1	explain basic steps in decision analysis and decision-making environments.	Understanding Level (C2)
CO-2	apply group decision making methods to reach a collective decision.	Applying Level (C3)
CO-3	develop the concept of multi criteria decision making process and attributes.	Understanding Level (C2)
CO-4	apply elementary methods to solve multi attribute decision making problems.	Applying Level (C3)
CO-5	analyze value based and outranking methods to solve multi attribute decision making problems.	Analyzing Level (C4)

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	Multi-attribute Decision Making, Multi Objective Decision Making, Decision Making Process, Structuring Process, Decision Matrix, Attributes, Normalization, Attribute Weight Assignment Methods.	8
4.	Elementary Methods for	Dominance Relation method, Even-Swap method, Lexicographic method Maximax method, Maximin	8

	MADM	method, Conjunctive method, Disjunctive method, Median Ranking, Analytic Hierarchy Process, Analytic Network Process.	
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 are divided in a group of 4-5 to do a survey on the applications of classical and recent multi attribute decision making techniques in their respective branches. The student recognizes the multi attribute decision making problems arising in real life and solves these problems with the help of MADM techniques learnt in this course.

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.

Optimization Techniques (16B1NMA831)

Course Description

Course Code	16B1NMA831	**Semester** Even		**Semester** VIII **Session** 2022-2023 **Month from** Jan 2023 to June 2023	
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	apply generalized, revised and dual simplex method for linear programming problems (LPP).	Applying Level (C3)
C402-2.2	apply graphical, algebraic and linear programming techniques for pure and mixed strategy problems in game theory.	Applying Level (C3)
C402-2.3	classify and solve the problems on queuing and inventory models.	Analyzing Level (C4)
C402-2.4	solve and analyze the network scheduling and sequencing problems.	Analyzing Level (C4)
C402-2.5	make use of dynamic programming technique to solve complex linear programming problems.	Applying Level (C3)
C402-2.6	determine numerical solution of nonlinear multidimensional problems.	Evaluating Level (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**

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	22B12CS413	**Semester:** EVEN	**Semester** 8th **Session**2022-2023 **Month**: Jan 2023 to Jun 2023
Course Name	Data Analytics using R and Python		
Credits	3	**Contact Hours**	**3-0-0**
NBA Code	C433-9		

Faculty (Names)	**Coordinator(s)**	Dr. MeghaRathi (J62) & Dr. Raju Pal(J128)
	Teacher(s) (Alphabetically)	Dr. MeghaRathi (J62) & Dr. Raju Pal(J128)

COURSE OUTCOMES		**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's & Setting up, Lists & Dictionaries, Functions & Packages, Data frame, Import and Export data , Data Preprocessing.	7
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, Fisher Exact Test	6
3.	Correlation &Association Analysis	Pearson Correlation, Spearman Correlation, Kendall Tau Correlation, Affinity Analysis & Market Basket Analysis, APriori Algorithm, Association Rules, Frequent Pattern AnalysisCase Study-I.	7
4.	Data Analysis Techniques	Analysis of Streaming Data, Applications of ML Library in R & Python for Supervised & Unsupervised Learning, Basic Neural Network, Transfer Function Models,	10

		Multivariate Time Series Analysis, Case Study-II.	
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, Statistical Inference, Volatility Analysis, Case Study-III.	8
6.	Model Evaluation Techniques	Model Evaluation Measures for Classification Task, Decision Cost/ Benefit Analysis, Rationale for measuring Cluster Goodness, Silhoutte Method, Pseudo F-Statistic	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,Quiz/ Mini-Project/Assignment**)
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.	Haider, M. (2015). Getting Started with Data Science: Making Sense of Data with Analytics. IBM Press.
2.	Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of Hypotheses, Prentice Hall of India, 2014.
3.	Douglas C. Montgomery, Cheryl L. Jennings, Murat Kulahci, Introduction to Time Series Analysis and Forecasting, Second Ed., Wiley, 2016.
4.	David J. Pine, Introduction to Python for Science and Engineering, CRC Press, 2019.
5.	Jake vanderPlas, Python Data Science Handbook – Essential Tools for Working with Data, O'Really Media, 2017
6.	Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007
7.	Kabacoff, Robert I. R in action: data analysis and graphics with R. Simon and Schuster, 2015.
8.	Fandango, A. (2017). Python Data Analysis. Packt Publishing Ltd.

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.".

Course Description

Course Code	15B29CI891	**Semester** ODD **(specify Odd/Even)**	**Semester** VIII **Session** 2022 -2023 **Month from** Jan to June 2023
Course Name	**Project Part – 2 (IT)**		
Credits	8	**Contact Hours**	…

Faculty (Names)	**Coordinator(s)**	Prashant Kaushik
	Teacher(s) (Alphabetically)	Entire Department

COURSE OUTCOMES		**COGNITIVE LEVELS**
C451.1	Summarize the contemporary literatureand explore tools for hands-on in the respective project area	Understand Level (Level 2)
C451.2	List out the specific requirements to develop the workable solution for the identified computing problem	Analyze Level (Level 4)
C451.3	Develop a working model for the identified problem	Apply Level (Level 3)
C451.4	Inspect the developed solution using exhaustive test cases and evaluate its performance using statistical methods and relevant metrics	Evaluate Level (Level 5)
C451.5	Report the results and findings of the project in written and verbal formats	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	22B12CS414	Semester Even (specify Odd/Even)	Semester: VIII[th] Session 2022 -2023 Month from February to June
Course Name	Agile Software Development Process		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr Amarjeet Prajapati
	Teacher(s) (Alphabetically)	Dr Amarjeet Prajapati

COURSE OUTCOMES		COGNITIVE LEVELS
C433-10.1	Interpret the trade-offs between traditional software development methods and agile software development methods for a software project effectively.	Understand level (Level 2)
C433-10.2	Identify and make use of an appropriate agile software engineering approach viz. extreme programming, Scrum, Crystal techniques as a part of software development.	Apply Level (Level3)
C433-10.3	Apply Refactoring techniques on source code for improved design	Apply Level (Level3)
C433-10.4	Choose tools and construct the methods for testing Agile projects using various testing strategies	Apply level (Level3)
C433-10.5	List the Planning, tracking, estimation and monitoring of agile projects with techniques like burn down charts, velocity calculation and task boards etc.	Analyze level (level4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Traditional software development methods, Agile software development methods and lean software development methods	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.	Requirements and Planning	User stories, agile estimation, planning techniques- Prioritizing Themes, Financial prioritization, prioritizing desirability	4
4.	Scrum	Introduction, Scrum - Prioritizing, Estimating, and Planning, The Scrum Experience (hands-on exercise)	5
5.	Extreme Programming (XP)	Extreme Programming Values, Principles and Practices, Pair programming, Embracing change, incremental change	5
6.	Crystal	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
7.	Kanban	The principles of kanban, Improving process with kanban,	4

		Measure and manage flow, Emergent behavior	
8.	Feature-Driven Development	Processes of feature driven development, practices and progress in FDD	2
9.	Testing	Agile testing strategy, automated unit test, test plan, test driven development, alpha, beta and acceptance testing	5
10.	Refactoring	Bad smells in code, properties of refactoring, refactoring examples, benefits, cost and risk of refactoring	7
		Total number of Lectures	42

Evaluation Criteria

Components	Maximum Marks
T1	20
T1	20
End Semester Examination	35
TA	25 Attendance (10) + Assignment/Quiz/Mini-project (15)
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.	Cohn, Mike. Agile estimating and planning. Pearson Education
2.	Beck, Kent. Extreme programming explained: embrace change. Addison-wesley professional
3.	Martin, Robert C. Agile software development: principles, patterns, and practices. Prentice Hall.
4.	Shore, James. The Art of Agile Development: Pragmatic guide to agile software development. " O'Reilly Media, Inc.".
5.	Schwaber, Ken. Agile project management with Scrum. Microsoft press
6.	Stellman, Andrew, and Jennifer Greene. Learning agile: Understanding scrum, XP, lean, and kanban. " O'Reilly Media, Inc."
7.	Cohn, Mike. User stories applied: For agile software development. Addison-Wesley Professional

Detailed Syllabus
Lecture-wise Breakup

Course Code	22B12CS415	**Semester Even (specify Odd/Even)**	**Semester** 8th **Session** 2022 **Month from** January 2023 to May 2023
Course Name	Artificial Intelligence in Healthcare and Smart Systems		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Ankit Vidyarthi
	Teacher(s) (Alphabetically)	Dr. Ankit Vidyarthi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C433-7.1	Understand the fundamental concepts of AI in healthcare Industry	Understand Level (Level 2)
C433-7.2	Understand the procedure to apply AI to EHR Data	Understand Level (Level 2)
C433-7.3	Applying AI to 2D Medical Imaging Data	Apply Level (Level 3)
C433-7.4	Analyze the concept by applying AI to 3D Medical Imaging Data	Analyzing Level (Level 4)
C433-7.5	Evaluate the concept of AI to Wearable Device Data	Evaluate Level (Level 5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	AI introduction, Connection of AI with Healthcare, Use and Applications of the AI for healthcare problems, AI pipeline	4
2.	Model Architectures	Basics of Model architectures, Open Source API's for Model designing, Classification Models – KNN, Neural Network (Perceptron, Feed Forward, and Backpropagation), Segmentation – Kmeans, FCM, and Hierarchical models, Regression and Prediction Models	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, Evaluating, and Interpreting Models.	8
4.	2D Image Analysis	AI for 2D medical imaging is and its relevancy, 2D medical imaging modalities and their clinical applications, machine learning algorithms for 2D medical imaging, Statistically assess an algorithm's performance, Translating AI Algorithms for Clinical Settings, 2D Medical Imaging Exploratory Data Analysis	10

5.	3D Image Analysis	3D Medical Imaging – Clinical Fundamentals, Exploratory Data Analysis, 3D Medical Imaging – Deep Learning Methods, Deploying AI Algorithms in the Real World	8
6.	Wearable Devices	Intro to Digital Sampling & Signal Processing, Introduction to Sensors, Activity Classification, ECG Signal Processing,	6
		Total number of Lectures	**42**

Evaluation Criteria

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

Project Based Learning: Students in a group of 3-4 will take some real world problem and apply AI logics to solve the healthcare problem in a meaning way. Students can able to understand the core logic about data handling and processing.

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.	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, 2013
4.	Adam Bohr, Kaveh Memarzadeh, Artificial Intelligence in Healthcare, Elsevier Science, 2020

Detailed Syllabus

Lecture-wise Breakup

Course Code	**22B12CS418**	**Semester** EVEN **(specify Odd/Even)**	**Semester** VIII **Session** 2022 -2023 **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	Simulation of UAVs using open source autopilot systems and design/development of small drone based applications.	Apply (L3)

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** 2022 -2023 **Month : January to May 2023**
Course Name	Software Construction using Microservices & Kubernetes		
Credits	**4**	**Contact Hours**	**4**

Faculty (Names)	**Coordinator(s)**	Dr. Anubhuti, Dr. Sulabh Tyagi
	Teacher(s) (Alphabetically)	Dr. Anubhuti, Dr. Sulabh Tyagi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C434-6.1	To design the complete delivery pipeline using DevOps practices.	Understand level (Level 2)
C434-6.2	Understanding monolithic and microservices architecture, and different microservice technologies	Understand Level (Level2)
C434-6.3	To design different microservices using REST architecture, domain drivers and design patterns	Apply Level (Level3)
C434-6.4	Creating security and test strategies for microservices using access tokens and test principles	Create level (Level 6)
C434-6.5	Understanding Kubernetes containerization concepts through kubectl commands and pod concepts	Understand level (level2)
C434-6.6	Creating an application deployment infrastructure by using kubernetes controllers and load balancers	Create level 6 (Level3)

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	Introduction to Jenkins (With Architecture), Jenkins Management, Adding a slave node to Jenkins, Building Delivery Pipeline	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 fundamentals	Kubernetes core concepts, kubectl commands, Pods concepts, configuring cluster nodes	6
7.	Kubernetes implementation	Kubernetes services and controllers, load balancing and deployment, configuring kubernetes scheduler, deploying an application using dashboard	6
		Total number of Lectures	42

Evaluation Criteria

T1:20

T2:20

T3:35

TA: 25 (Attendance, quizzes, assignments, demonstration)

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** 2022 -2023 **Month from:** Feb 2023 to June 2023
Subject Name	Cloud computing essentials: Azure and AWS		
Credits	**3**	**Contact Hours**	**3-0-0**

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

COURSE OUTCOMES		**COGNITIVE LEVELS**
C434-7.1	Examine the fundamentals of Cloud Computing, its applicability and architecture.	Understand (level 2)
C434-7.2	Examine the architecture and services of AWS (Amazon Web Services) cloud platform.	Analyze (level 4)
C434-7.3	Examine the architecture and services of Azure cloud platform.	Analyze (level 4)
C434-7.4	Examine the architecture and services of Google Cloud platform.	Analyze (level 4)
C434-7.5	Develop the applications using appropriate cloud platforms.	Apply (level 3)

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
1	Sosinsky, Barrie A.. "Cloud Computing Bible." (2010).
2.	Pace, Eugenio et al. "Developing Applications for the Cloud on the Microsoft Windows Azure Platform." (2010).
3	Reese, George. "Cloud Application Architectures - Building Applications and Infrastructure in the Cloud." (2009).
4	Diaz, Francesco and Roberto Freato. "Cloud Data Design, Orchestration, and Management Using Microsoft Azure." *Apress* (2018).