Detailed Syllabus
Lecture-wise Breakup

Course Code	17M12EC125	**Semester:** Even 2023	**Semester: 8th Session:** 2022-23 **Month from** January to May 2023
Course Name	Detection and Estimation Theory		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Dr. Gaurav Khanna
	Teacher(s) (Alphabetically)	Dr. Gaurav Khanna

COURSE OUTCOMES		**COGNITIVE LEVELS**
C115.1	The course aims to familiarize student with stochastic processes and its properties.	Understanding Level (C2)
C115.2	The course helps students to analyze probabilistic models and estimate the parameters of the model parameters.	Analyze Level (C4)
C115.3	The course helps students evaluate the observations of the noise-corrupted functions and determine the best estimate of the state.	Evaluating Level (C5)
C115.4	The course helps student compute the optimality criteria to quantify best estimates or detection decisions and limits on performance.	Analyze Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	**Review of Random Variables**	Distribution and density functions, moments, independent, uncorrelated and orthogonal random variables; Vector-space representation of random variables, Schwarz Inequality, Orthogonality principle in estimation, Central limit theorem, Random Process, Stationary process, autocorrelation and auto-covariance functions, Spectral representation of random signals, Wiener Khinchin theorem, Properties of power spectral density, Gaussian Process and white noise.	6
2.	**Parameter Estimation theory**	Principal of estimation and applications, Properties of estimates, unbiased and consistent estimators, MVUE, CR bound, Efficient estimators; Criteria of estimation: The methods of maximum likelihood and its properties; Bayesian estimation: Mean Square error and MMSE, Mean Absolute error, Hit and Miss cost function and MAP estimation.	8
3.	**Estimation of signal**	Linear Minimum Mean-Square Error (LMMSE) Filtering: Wiener Hoff Equation FIR Wiener filter, Causal IIR Wiener filter, Non-causal IIR Wiener	8

	in the presence of White Gaussian Noise (WGN)	filter, Linear prediction of signals, Forward and Backward Predictions, Levinson Durbin Algorithm, Lattice filter realization of prediction error filters.	
4	**Complexity Computations**	Principle and Application, Steepest Descent Algorithm, Convergence characteristics; LMS algorithm, convergence, excess mean square error, Leaky LMS algorithm; Applications of Adaptive filters; RLS algorithm, derivation, Matrix inversion Lemma, Initialization, tracking of non-stationarity.	8
5.	**Kalman Filtering**	Principle and application, Scalar Kalman filter, Vector Kalman filter.	4
6.	**Detection Theory**	Hypothesis testing, Bayesian, Neyman-Pearson and Minimax detection, Composite Hypothesis testing, Generalized LRT, Sequential and Distributed Detection, Non-parametric detection, Detection in Gaussian noise.	8
		Total number of Lectures	42

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (5 Assignment, 5 Quiz, 5 Class Participation, 10 Attendance)
Total	**100**

Project Based Learning: After studying the contents of this Course students will be able to design Least Mean square estimators, Biased and Unbiased estimators, and optimal estimators. These estimators find widespread applications in the area of Communication and Signal Processing applications especially adaptive systems. Students shall also learn the techniques to design and analyse detectors for various applications.

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.	An Introduction to Signal Detection and Estimation by H. Vincent Poor, Springer, 1994.
2.	Linear Estimation by Thomas Kailath, Ali H sayed, Babak Hassibi, Prentice Hall, 2000.
3.	Fundamentals of Statistical Signal Processing: Detection theory by Steven M. Kay, Pearson, 2010.
4.	Fundamentals of Statistical Signal Processing: Estimation theory by Steven M. Kay, Pearson, 2010.

Detailed Syllabus
Lecture-wise Breakup

Course Code	17M12EC128	**Semester**: Even 2023	**Semester-** 8th, **Session:** 2022 -2023 **Month from Jan 2023 – June 2023**
Course Name	Software Defined Radio and Cognitive Radio Network		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Dr. Samriti Kalia
	Teacher(s) (Alphabetically)	Dr. Samriti Kalia

COURSE OUTCOMES		**COGNITIVE LEVELS**
C122.1	Understand the concepts of Software Defined Radio (SDR) and its architecture	Understanding Level (C2)
C122.2	Understand the concepts of radio (CR) architecture, functions of cognitive radio	Understanding Level (C2)
C122.3	Analyzing the Spectrum sharing and management and Spectrum sensing methods	Analyzing Level (C4)
C122.4	Evaluating the performance of Next Generation Wireless Networks	Evaluating Level (C5)

Module No.	**Title of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	**Software Defined Radio (SDR)**	Essential functions of the SDR, SDR architecture, design principles of SDR, traditional radio implemented in hardware and SDR, transmitter architecture and its issues, A/D & D/A conversion, parameters of practical data converters, techniques to improve data converter performance, complex ADC and DAC architectures, digital radio processing, reconfigurable wireless communication systems.	8
2.	**Cognitive Radio (CR) features and architecture**	Cognitive Radio (CR) features and capabilities, CR functions, CR architecture, components of CR, CR and dynamic spectrum access, interference temperature, CR architecture for next generation networks, CR standardization.	8
3.	**Spectrum sensing**	Spectrum sensing and identification, primary signal detection. energy detector, cyclostationary feature detector, matched filter, cooperative sensing, spectrum opportunity, spectrum opportunity detection, fundamental trade-offs: performance versus constraint, sensing accuracy versus sensing overhead.	10
4.	**Spectrum management of cognitive radio net-works**	Spectrum decision, spectrum sharing and spectrum mobility, mobility management of heterogeneous wireless networks, Cooperation and cognitive systems and research challenges in CR	10
5.	**Next Generation**	Control of CRN, Self-organization in mobile communication	6

	Wireless Networks	networks, security in CRN	
		Total number of Lectures	**42**

Evaluation Criteria

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

Project Based Learning: Students will learn about the design and implementation of cognitive radio using SDR. Additionally, students in group sizes of three-four required to prepare a review of SDR and cognitive radio using one or more research publications including interfacing softwares.

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.	Kwang-Cheng Chen and Ramjee Prasad, "Cognitive Radio Networks", John Wiley & Sons, Ltd, 2009.
2.	Alexander M. Wyglinski, Maziar Nekovee, and Y. Thomas Hou, "Cognitive Radio Communications and Networks - Principles and Practice", Elsevier Inc., 2010.
3.	Jeffrey H. Reed "Software Radio: A Modern Approach to radio Engineering", Pearson Education Asia.

Detailed Syllabus

Lecture-wise Breakup

Subject Code	20M11EC111	**Semester:** EVEN	**Semester:** I Session**: 2022-2023** **Month from** January **to** May
Subject Name	Advanced RF and Microwave Engineering		
Credits	3	**Contact Hours**	3
Faculty (Names)	**Coordinator(s)**	Dr. Jasmine Saini	
	Teacher(s) (Alphabetically)	Dr. Jasmine Saini	

COURSE OUTCOMES- At the completion of the course, students will be able to		**COGNITIVE LEVELS**
C141.1	Develop an understanding of concepts of microwave circuits and ISM applications.	Understanding (Level II)
C141.2	Explain the concepts of microwave circuits and scattering parameters.	Evaluating (Level V)
C141.3	Design and analyze impedance transformers.	Analyzing (Level IV)
C141.4	Design and apply microwave components like dividers, filters, resonators etc. in Microwave systems.	Applying (Level III)

Module No.	**Title of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Transmission Lines and Waveguides	Review of Microwave Engineering; Advantages, disadvantages and ISM applications of microwaves; TEM mode transmission lines: lossless line, line with small losses; Quasi TEM mode lines: Fields in micro striplines and striplines, losses in microstrips, microstrip discontinuities, coupled lines, slot lines and coplanar waveguides; Wave velocities.	8
2.	Microwave Circuit Theory Principles	Equivalent voltages and currents; Z, Y, S, and ABCD parameters; Equivalent circuit representation of microwave	10

		junctions; Scattering parameter analysis of microwave junctions.	
3.	Impedance Transformers	Review of single-, double- and triple-stub tuners; waveguide reactive elements; quarter-wave transformers; design of maximally flat and Chebyshev transformers; Introduction to tapered transmission lines.	6
4.	Power Dividers and Couplers	Scattering matrix of 3- and 4-port junctions; Design of T-junction and Wilkinson power dividers; Design of 90^o and 180^o hybrids.	6
5.	Filters	Analysis of periodic structures; Floquet's theorem; filter design by insertion loss method; maximally flat and Chebyshev designs.	6
	Resonators	Principles of microwave resonators; loaded, unloaded and external Q, open and shorted TEM lines as resonators; microstrip resonators; dielectric resonators.	6
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25(Attendance, Performance. Assignment/Quiz)
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.	Collin, R.E., "Foundations for Microwave Engineering", 2nd Ed., John Wiley & Sons,2000.

2.	Pozar, D.M., “Microwave Engineering”, 3rd Ed., John Wiley & Sons,2004.
3.	Edwards, T.C. and Steer M.B., “Foundations for Interconnects and Microstrip Design”, 3rd Ed., John Wiley & Sons.,2001.
4.	Ludwig, R. and Bretchko, P., “RF Circuit Design”, Pearson Education,2000.
5.	Hunter, I., “Theory and Design of Microwave Filters”, IEE Press,2001.
6.	Misra, D.K., “Radio-frequency and Microwave Communication Circuits”, John Wiley & Sons,2001.
9.	https://nptel.ac.in/courses/108/101/108101112/

Detailed Syllabus

Lecture-wise Breakup

Subject Code	**20M41EC119**	**Semester: EVEN (specify Odd/Even)**	**Semester** : 8th **Session** 2022 -23 **Month from** Jan **to** June
Subject Name	**MIMO-OFDM for Wireless Communications**		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	1. Dr. Alok Joshi
	Teacher(s) (Alphabetically)	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C117.1	To understand OFDM system with its impairments.	Understanding (C2)
C117.2	To understand and analyze the various performance parameters of OFDM system.	Analyzing (C4)
C117.3	To understand and analyze the performance of MIMO systems	Analyzing (C4)
C117.4	To understand the Single Carrier Frequency Division Multiplexing System	Understanding (C2)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Introduction	Basic principles of orthogonality, Single carrier vs. multi carrier systems, orthogonal frequency-division multiplexing (OFDM): Block diagram, modulation, demodulation, frequency spectrum, need of cyclic prefix. synchronization, peak-to-average power ratio, effect of HPA on OFDM signal,	7
2.	PAPR and PAPR Reduction Schemes	PAPR of Base band and Bandpass OFDM signal, PDF & CCDF of PAPR, Need of PAPR reduction , PAPR reduction techniques: Clipping, Iterative clipping and filtering, Companding schemes, Selective mapping (SLM), Partial transmit sequence (PTS), Tone Reservation (TR), Tone Injection, Active Constellation Extension (ACE).	12
3.	Inter Carrier Interference (ICI) and ICI cancellation Schemes	Effect of Frequency offset, ICI Cancellation Schemes: ICI self cancellation, Symmetric ICI Self-Cancellation Scheme , ICI conjugate cancellation etc.	8
4.	Multiple-input multiple-output (MIMO) Systems	MIMO System model, antenna diversity, MIMO detection algorithms: MIMO Zero-Forcing Receiver, MIMO MMSE Receiver, Singular Value Decomposition of MIMO Channel, MIMO capacity, Space-time coding. V-BLAST, MIMO Beamforming	12
5.	Single Carrier Frequency Division Multiplexing (SC-FDMA)	SC-FDMA, Transmitter and Receiver, Subcarrier Mapping, Advantages and disadvantages	3
		Total number of Lectures	**42**

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

Project based learning: Here, students will learn latest 4G wireless communication technologies, starting from the basics process of modulation, demodulation and its impairment. These schemes are of utmost importance to understand the concepts of current and future generations of communication system and to design the same . Student will be able to design the physical layer of 4G communication and to analyze its implementations issues. Students can perform the some simulation on Matlab to analyze the same. Understating of these techniques will further help to work in any core communication industry.

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.	Aditya K Jagannatham, Principles of Modern Wireless Communication Systems Theory and Practice, TMH, 2/e, 2017
2.	Yong Soo Cho, Jaekwon Kim, Won Young Yang, Chung-Gu Kang , MIMO-OFDM Wireless Communications with MATLAB, Wiley, 2013
3.	T. Jiang and Y.Wu, “An Overview: Peak-to-average power ratio reduction techniques for OFDM signals”, IEEE Transactions on Broadcasting, vol. 54, no. 2, pp. 257–268, Jun. 2008.
4.	Y. Zhao, S.G. Häggman , “Intercarrier interference self-cancellation scheme for OFDM mobile communication systems” , IEEE Transactions on Communications, 49(7), pp .1185-1191, 2001.
5.	Hyung G. Myung, “Introduction to single carrier FDMA”, In Proceedings of 2007 15th European Signal Processing Conference, Poznan, Poland, pp. 2144-48.
6.	Journal articles i.e. IEEE, Springer, NPTEL video lectures.

Detailed Syllabus

Course Code	15B19EC891	**Semester:** Even **(specify Odd/Even)**	**Semester:** 8th **Session** 2022 -2023 **Month from:** January to June
Course Name	Project Part-2		
Credits	12	**Contact Hours**	----

Faculty (Names)	**Coordinator(s)**	Megha Agarwal, Rahul Kaushik
	Teacher(s) (Alphabetically)	Abhishek Kashyap, Megha Agarwal, Rahul Kaushik,, Shivaji Tyagi

COURSE OUTCOMES- At the completion of the course, students will be able to,		**COGNITIVE LEVELS**
C451.1	Summarize the contemporary scholarly literature, activities, and explored tools/ techniques/software/hardware for hands-on in the respective project area in various domain of Electronics Engineering.	Understanding level (C2)
C451.2	Analyze/Design the skill for obtaining the optimum solution to the formulated problem with in stipulated time	Analyzing level (C4)
C451.3	Evaluate /Validate sound conclusions based on evidence and analysis	Evaluating level (C5)
C451.4	Develop the skill in student so that they can communicate effectively in both verbal and written form.	Creating Level (C6)

Evaluation Criteria

Components	**Maximum Marks**
Mid Sem Viva20	
Final Viva	30
Day to Day	30
Project Report	20
Total	**100**

Project based learning: Project part II is the continuation of Project part 1 done in the previous semester. The Project work is by far the most important single piece of work in the B. Tech programme. It provides the opportunity for student to demonstrate independence and originality, to plan and organize a large Project over a long period and to put into practice some of the techniques, student have been taught throughout the course. In Project work initially, first all students are advised to make groups having 2-3 students in each group and also to select the supervisor of their own choice and research field. The students are also advised to choose a Project that involves a combination of sound background research, software skill, or piece of theoretical work. Interdisciplinary Project proposals and innovative Projects are encouraged and more appreciable. Objective of project part II is for the students to learn and experience all the major phases and processes involved in solving "real life engineering problems related to electronics and communication or Interdisciplinary area. The major outcome of this project work must be well-trained the students. More specifically students must have acquired:

- System integration skills
- Documentation skills
- Project management skills
- Problem solving skills
- Team work skill.

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

Subject Code	**19M13HS111**	**Semester: Even**	**Semester: M.Tech II & Dual degree VIIISession 2022-23** **Month from January to May 2023**
Subject Name	**English Language Skills for Research Paper Writing**		
Credits	**2**	**Contact Hours**	**2-0-0**
Faculty (Names)	**Coordinator(s)**	Dr. Ekta Singh	
	Teacher(s) (Alphabetically)	Dr. Ekta Singh	

Course Outcomes:

At the completion of the course, students will be able to,

COURSE OUTCOMES		**COGNITIVE LEVELS**
C204.1	Demonstrate an understanding of all the aspects of grammar and language needed to write a paper.	Understand Level (C2)
C204.2	Apply grammatical knowledge & concepts in writing and presentation.	Apply level (C3)
C204.3	Examine each section of a paper after careful analysis of Literature Review.	Analyze Level (C4)
C204.4	Determine the skills needed to write a title, abstract and introduction, methods, discussion, results and conclusion.	Evaluate Level (C5)
C204.5	Compile all the information into a refined research paper after editing and proofreading	Create Level (C6)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lecturesand Tutorials for the module**
1.	Grammar & Usage	Structure of English Language Voice, Aspect & Tense SVOCA Sense & Sense Relations in English Enhancing Vocabulary Connotation, Denotation & Collocation	**6**
2.	Elements of Paper Writing	Planning & Preparation Word Order Breaking Long Sentences Structuring Paragraphs Being Concise and RemovingRedundancy Avoiding Ambiguity and Vagueness	**4**
3.	Paraphrasing & Writing	Highlighting Your Findings Hedging andCriticising Paraphrasing and Plagiarism Sections of a Paper Abstracts; Introduction	**6**

4.	Process of Writing	Review of Literature Methods Results Discussion Conclusion The Final Check	**4**
5.	Key Skills Needed	Key skills needed when writing a Title Key skills needed whenWriting an Abstract Key skills needed when writing an Introduction Key skills needed when writing a Review of the Literature Key skills needed when writing Methods & Results Key skills needed when writing Discussion & Conclusion	**4**
6.	Refining the Paper	Incorporating useful phrases Editing Proofreading References Annexures Ensuring good quality in submission	**4**
		Total number of Lectures and Tutorials	**28**

Evaluation Criteria

Components	**MaximumMarks**
Mid Term	30
End Semester Examination	40
TA	30 (Project, Assignment/ Class Test/ Quiz, Class Participation)
Total	**100**

3. Employability/entrepreneurship/skill development

Researchers whose first language is not English write at least two-thirds of published scientific papers. Twenty percent of the comments referees make when reviewing papers for possible publication in international journals regard English language issues. In some disciplines, acceptance rate by journals of papers originating from the US/UK is 30.4%, and is higher than all other countries

Publishing your research in an international journal is key to your success in academia. This course is based on a study of some sample manuscripts and reviewers' reports revealing why papers written by non-native researchers are often rejected due to problems with English usage and poor structure and content. The course prepares the students on how to:

- prepare and structure a manuscript
- increase readability and reduce the number of mistakes you make in English by writing concisely, with no redundancy and no ambiguity
- write a title and an abstract that will attract attention and be read
- decide what to include in the various parts of the paper (Introduction, Methodology, Discussion etc)
- highlight your claims and contribution
- avoid plagiarism
- discuss the limitations of your research
- choose the correct tenses and style
- satisfy the requirements of editors and reviewers

Recommended Reading material:	
1.	Goldbort R. 'Writing for Science', Yale University Press (available on Google Books), 2006
2.	Day R. 'How to Write and Publish a Scientific Paper', Cambridge University Press, 2006
3.	Adrian Wallwork. 'English for Writing Research Papers', Springer, New York, Dordrecht Heidelberg, London, 2011
4.	Yadugari M.A. ' Making Sense of English: A Textbook of Sounds, Words & Grammar' Viva Books Private Limited, New Delhi, 2013, Revised Edition
5.	Strauss Jane. 'The Blue Book of Grammar and Punctuation, Josseybass, Wiley, San Francisco, 1999.
6.	Rizvi, A. R. 'Effective Technical Communication' 2nd edition, McGraw Hill Education Private Limited, Chennai, 2018
7.	Eckert, K. 'Writing Academic Paper in English:Graduate and Postgraduate Level', Moldy Rutabaga Books, 2017
8	Barros, L.O, 'The Only Academic Phrasebook You'll Ever Need: 600 Examples of Academic Language' Create Space Independent Publishing Platform; 1st edition,2016
9	Wallwork, A. 'English for Writing Research Papers (English for Academic Research)'.Springer; 2nd ed. 2016 edition.
10	Wallace,M&Wray,A. 'Critical Reading and Writing for Postgraduates (Student Success) SAGE Publications Ltd; Third edition, 2016
11	Butler, L. 'Longman Academic Writing Series 1: Sentences to Paragraphs, with Essential Online Resources', Pearson Education ESL; 2nd edition,2016
12	Saramäki, J. 'How to Write a Scientific Paper: An Academic Self-Help Guide for PhD StudentsIndependently published, 2018

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.

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.