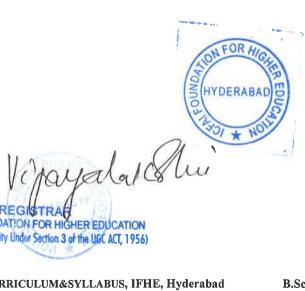


All the precautions have been taken to print the Course Curriculum accurate. However, mistakes if any will be corrected as and when noticed. The University reserves the right to include/exclude any content at any point of time during the progression of the course.

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the

Item #	Description	Page#
1	Introduction	3
2	B.Sc (Physics) and B.Tech.(DS&AI)Program Structure	16
3	Course Descriptions	19
4	Handouts	36
5	Registration	190
6	Teaching & Evaluation	193
7	Grading	198



REGISTRAN
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

# 1. INTRODUCTION

# 1.1 The ICFAI Foundation for Higher Education

The ICFAI Foundation for Higher Education (IFHE) is declared as a Deemed-to-be University, under Section 3 of the UGC Act, 1956. It has evolved a comprehensive student-centric learning approach consisting of several stages, designed to add significant values to the learner's understanding in an integrated manner, covering relevant knowledge, practical skills and positive attitudes. IFHE comprises of:

- Faculty of Management (IBS Hyderabad),
- Faculty of Science and Technology (IcfaiTech), and
- Faculty of Law (FoL).

#### Vision and Mission of IFHE

The vision of IFHE is to be a top ranking University of choice for students, staff and corporates, recognized for excellence in Higher Education and Research especially relevant to social needs.

The mission of the Deemed University is to offer world class, innovative, career-oriented professional postgraduate and undergraduate programs through inclusive technology- aided pedagogies to equip students with the requisite professional and life skills as well as social sensitivity and high sense of ethics. The University will strive to create an intellectually stimulating environment for Research, particularly in areas bearing on the socio-economic and cultural development of the state and the nation.

# 1.2 Faculty of Science and Technology (IcfaiTech)

Faculty of Science and Technology (IcfaiTech), Hyderabad is a constituent of the ICFAI Foundation for Higher Education. It has been established to promote quality education in the field of Science and Technology. IcfaiTech strives to acquire a reputation as a highly purposive, innovative institution setting the pace for workable reforms in professional education suitable and most relevant for the Indian cultural milieu.

ed-to-be-University Under Section 3 of the UGC ACT, 1956

lcfaiTech - CURRICULUM&SYLLABUS, IFHE, Tygerabad

B.Sc (Physics) and B.Tech.(DS&AI)

**VISION** 

The IcfaiTech campus shall become a leading institute for scientific research as well as

innovative teaching and learning, keeping pace with evolving knowledge domains. It shall

emerge as an attractive destination for the excellent students and the faculties. IcfaiTech

aspires to be highly ranked amongst the group of other peer institutes.

MISSION

The mission of the IcfaiTech is to provide high quality teaching and learning experience

through our first degree and higher degree programs.

• Teaching Excellence: IcfaiTech periodically reviews and redesigns existing courses and

introduces new courses and programs geared towards current research and industry. It explores

new dimensions in teaching and learning and uses various platforms and methodologies.

• Research Excellence: The faculty members of the department carry out research in almost all

the major areas. The department is now vigorously scaling up its research activity and giving

more visibility to it. The volume of research publications in peer reviewed journals of repute

and the research funding received by the department has been increasing steadily.

• Faculty Leadership in Administration: The faculty members of the department make

significant contribution to administrative leadership and various institute activities and

initiatives.

1.3 Educational Philosophy

The core philosophy of education at IcfaiTech is empowering students with the right

knowledge and modern skill sets in order that they are ready to face the challenges of the

competitive world. IcfaiTech strives to provide its students with the fine edge that is required

in the making of a successful professional. The programs at IcfaiTech have been uniquely

designed by including courses drawn from varied areas like humanities, arts, and management

combined with science, engineering and industry-based internships. IcfaiTech ensures that

students gain exposure and knowledge across different disciplines, develop inter-personal skills

and leadership qualities that takes them beyond traditional tracking and practice. Today's era

of globalization and integrated economies presents latented professionals huge opportunities

NOIL B & (Physics) and B.Tech.(DS&AI)

THE XOPAL

from across the world. The curriculum at IcfaiTech is truly global and modern in perspective and exposes its students to the latest practices and techniques. The curriculum offers a cafeteria approach allowing them to choose courses from across the disciplines. This exposure also helps them to develop interests in tune with the current inter-disciplinary nature of research. The educational philosophy practices at IcfaiTech allows it to integrate into its learning system, an innovative and emerging body of knowledge. The highlights of the academic program are summarized below:

- Cutting-edge course curriculum with contemporary and effective pedagogic methods that lay emphasis on application-oriented learning.
- Encouraging students to not only articulate Science and Technology needs but also provide appropriate solutions.
- Developing appreciation for synthesized multidisciplinary learning by way of workshops, internships and other group learning assignments.

# 1.4 Objectives of IcfaiTech

- To provide high quality, cutting-edge and career-oriented education programs in Science and Technology.
- To offer practice-oriented, contemporary and flexible programs developed through regular assessment and consultation with leading institutions, academicians, professionals and practitioners.
- To turn out highly motivated and successful Science and Technology graduates to meet the current and projected needs of the knowledge workforce.

#### 1.5 Flexibilities

A few of the flexibilities available to the students are mentioned below. The principle of merit, preference of the students and the facilities available at the Institute generally guide the decisions regarding flexibilities. Transfer: Every year, various branches of engineering are ranked based on the preferences and demands of the admitted batch of students. After two semesters of study (end of the first year), students can seek transfer across branches. Requests from students seeking transfer from a less preferred branch to the most preferred branch of B.Tech would be considered if they maintain a CGPA of not less than 9.00, by the end of the first year of degree program. For a branch transfer to the second most preferred branch, a student should have a CGPA of not less than 7.00 by the end of degree

IcfaiTech - CURRICULUM&SYLLABUS, IFHE Hyderabad

(Physics) and B.Tech.(DS&AI)

program. A branch transfer from a more preferred branch to a less preferred branch would be permitted without any restrictions on CGPA. Audit: Over the years of study at IcfaiTech, a student may develop interest in areas that go beyond the scope of his/her program of studies.

IcfaiTech permits students to take such courses as audit courses. Certain courses like Foreign

Languages, Music, etc. which are not the part of a degree program could be opted for on an

audit basis, on payment of additional fees. Audit courses do not count for the CGPA

calculation.

Other Flexibilities: The Academic Regulations also provide flexibilities like choice of electives, number of electives, repetition of courses, departure from normal pace, withdrawal from or substitution of course(s).

1.6 Admissios at IcfaiTech:

Admission Test for IcfaiTech (ATIT) is an All India Admission Test conducted by IcfaiTech, IFHE, Hyderabad for students seeking admission into the 4 year Integrated B.Tech. Programs and 3 year Integrated B.Sc Programs.

ATIT 2020 is an aptitude test conducted through online & offline tests constitute objective type questions in Mathematics, Physics, Chemistry, English and logical reasoning in multiple choice format. Question paper pattern is given below and syllabus given in website www.ifheindia.org/icfaitech.

Eligibility for admission into the B.Tech/BSc Program:

• Pass with 60% and above aggregate marks in Class XII ("or its equivalent") with Mathematics, Physics, Chemistry and English as subjects.

• Class XII (or icfaitech equivalent) students awaiting final examination results may also apply.

• Applicants should have completed 12 years of formal schooling in order to apply for the program.

• The applicant should fulfil the minimum age requirements as prescribed by the respective Board through which the applicant has appeared for the qualifying examination.

lcfaiTech - CURRICULUM&SYLLARUS IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

THE IOFALFEE IN

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION TO BE TO SHOW THE PROPERTY OF THE PROPERTY

ad-to-be-University Under Section 3 of the

# 1.7 Programs at IcfaiTech

At IcfaiTech, the programs offered are divided into three tiers, namely the first degree programs, the higher degree programs and the doctoral programs falling into the first, second and the third tiers respectively. All the undergraduate, integrated programs fall under the first degree programs. The various masters programs fall under the category of the higher degree programs. The Ph.D. programs offered by various departments fall under the category of doctoral programs. The academic structures of each of these programs are discussed below.

# First Degree Programs (First Tier)

There are three first degree programs being offered at IcfaiTech, the details of which are available in the prospectus/view book. Without going into the details of the regulatory processes, it is necessary to touch upon the subject to obtain a better understanding of these processes, which are controlled by these regulations in respect to operation.

There may be some restrictions from time to time in terms of flexibilities like transfer or dual degree concerning these degree programs. This will be notified in the prospectus/view book as per periodic decision of the Academic Council. All operational matters concerning this will be controlled by the PGC.

# **Program Courses**

The various courses prescribed for a program of study may be categorized in terms of their academic affinity or their functional objectives. Depending on overall educational goals of programs, it is possible to have fixed named courses in a particular category, to have fixed number of electives; to have a range of named courses in a particular category and to have a number of electives within a range. Named courses are those indicated by course number and course title in the semester-wise- pattern prescribed for a program

For first degree students the named courses include all mandatory courses under the General Institutional Requirement and the Discipline Specific Core courses, known as Compulsory Discipline courses (CDCs), for the program(s). The Elective courses fall under three categories: Discipline Electives, Humanities Electives and Open Electives. Open Electives enable students to pursue courses that are neither part of the discipline requirement nor part of the humanities requirement. Normally any elective course will be treated as an Open Elective once the student's requirement under Discipline Electives and Humanities Electives have been accounted for. Open elective requirement of Dual degree students is met by coursing the tracipline Electives of one

IcfaiTech - CURRICULUM&SYLLABUS, IFME Hyderabad

(Physics) and B. Tech. (DS&AI)

HYDERABAD B

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 2 of the 1964 Act, 195

degree as Open Electives of the other degree. A first degree student may also choose, where permitted, up to a certain prescribed maximum of his/her elective courses from the offerings in the higher degree, subject to the approval by the DCA and the prerequisite requirements and clause 3.18 regarding over preparedness and under preparedness. Provided that, if such a student after graduation is admitted to a higher degree program his/her total requirement in the latter cannot ipso facto be reduced.

The prior preparation required of a student who intends to choose courses from a higher degree program of the Institute for the fulfillment of his/her elective requirement(s) are given in clause 3.15.

In a program all courses outside the elective categories are defined as named courses, in view of the fact that they have already been named in the semester-wise-patterns in the prospectus/view book or have been named by an appointed authority through subsequent operation on the basis of guidelines given in the prospectus/view book. The electives are, on the other hand, selected by the student himself/herself from outside the named courses in his/her program. The intended regions where he/she goes for the search will be designated as host regions. Certain specialized courses, Internship programs, Thesis etc., These courses are named courses for some specific programs and they are debarred to other students as electives in the same way as they are debarred to students who wish to take them on audit.

For each program the number of electives, under each of the categories, required to be taken by a student will be prescribed either through the prospectus/view book or through an appropriate committee. Over and above the prescribed number of electives, a student of an integrated first degree program will be allowed to take, on his/her own option, up to a maximum number of four electives. In extraordinary cases, the number may be increased by the DCA without violating limit. For the purpose of eligibility for degree(s),a student should get valid grades in at least the prescribed number of electives — under each of the categories, of his/her program(s). The student above a particular CGPA as prescribed by ACC will be allowed to register in maximum of one higher degree course per semester. This will be counted as open elective unless the course is listed in pool of discipline electives for his/her program.

Once a first degree student is declared to have fulfilled the requirements of graduation the student may be permitted to register for at most one additional semester with prior permission of his/her Coordinator(s)of Department and Chairperson-Academics. Any first degree student who is interested in pursuing open elective(s) above the graduation requirements and/or completing a minor

IcfaiTech – CURRICULUM&SYLLABUS, IFME, Hyderabad REGISTRAR

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR THE ICFAI COLOR (Desired to be University Under Section (CT, 1956)

program he/she is pursuing and if that necessitates overstay, he/she should obtain permission from Chairperson- Academics at least one semester before the start of the overstay period. The overstay period can be at most one semester during which the student must register for at least three new courses of at least 9 units. In case a student withdraws from one or more of his/her courses or otherwise is found not to be pursuing his/her courses in all earnestness Chairperson-Academics in concurrence with the student's department Coordinator is authorized to get him/her graduated and evacuate the student from the campus.

The structure contains a category of courses such as Internship Program (IP)/Thesis (TS), which attempts a synthesis of earlier courses and gives a glimpse of the application of these courses. They carry a large number of units and are to be pursued when student can ensure sufficient time and attention throughout the allotted period. In particular, IP components are to be pursued exclusively full time throughout the allotted period. There is no provision for taking other courses along with an IP component. In case of a Thesis a student may choose between 12 units worth of thesis work or 20 units worth of thesis work with the concurrence of his/her supervisor. A student pursuing a 20 unit thesis must pursue it exclusively full time throughout the allotted period and there is no provision for taking other courses along with it. A student pursuing a 12 unit thesis may concurrently pursue at most 3 courses (totaling at most 9 units) and will not be allowed to pursue any other course/component.

## The Higher Degree Programs (Second Tier)

At higher degree level, structure of the program is classified into courses, like, Research Methods, CDCs, electives, IP and thesis. Registration for the IP can be done only after all other required courses have been completed.

In the case of thesis, while normal registration can be done only after completion of all other courses, in extraordinary cases, the DCA may allow registration in Dissertation, spread over various semesters, along with other courses. A student of higher degree program can register up to a maximum of one elective more than those prescribed in a semester. This additional elective can be from the pool of electives of the concerned degree or named/electives courses from other disciplines' with the permission of DCAs – namely the DCA of the student's Department and the DCA of the Department offering the course that the student wants to pursue. The grade obtained in such additional electives will also be counted towards the CGPA. Each course in the Core Requirement or in the List of Electives must be a graduate level (5th or 6th level) course or an advanced under-graduate course (4th level) with the restriction that a student may use at the most

B.Tech.(DS&AI)

IcfaiTech - CURRICULUM&SYLLABUS, FHE, Hyderabad

CFAI FOUNDATION FOR HIGHER EDUCATION 1840-be University Under Section 3 of the UGC ACT, 1956

two 4th level courses to meet the requirements in above.

### Ph. D Program (Third Tier)

The Ph.D. program is designed for the student to achieve a broad competence before research begins. He/she is required to clear certain course work, if not already cleared, and pass the Qualifying Examination to satisfy the institute that his/her spectrum of knowledge is such as to enable him to undertake the demands of interdisciplinary research. Working knowledge of a modern European language, wherever specified, Teaching Practice, Independent Study, Research Methodology and specified units of Thesis course and Seminar are significant components of the Ph.D. program. The pursuit of research through the Thesis-Seminar course will continue and terminate in a thesis which meets the standards and requirements of the committee of scholars.

#### 1.8. The Academic Year

At IcfaiTech, the academic year is divided into two semesters (First Semester and the Second Semester) and a term called Summer Term. Each semester is of 18 weeks duration and summer term of 8 weeks duration. There are eight semesters during the four year B.Tech program. After completing the first four semesters, the students undertake an Internship Program (IP-1) for two months. During the final year, students go for five and half month's duration Internship Program-II (IP-II) in either of the two semesters and the adjoining summer term. Instead of the Internship Programs, a student can opt for Thesis/Seminar in the final year.

# **Structure of B.Tech Program**

The program of studies leading to the award of a B.Tech degree consists of the prescribed courses sequentially distributed over the required number of semesters known as Semesterwise pattern.

The program is planned in such a way that in the normal course, a student will complete the program in 8 semesters. Categorization of Courses The courses are categorized as

- Basic Sciences Courses
- Analysis Oriented Courses
- Engineering Science Courses
- Humanities Courses
- Technical Art Course

IcfaiTech - CURRICULUM&SYLLABUS IIIIE, Hyderabar BSc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR THE ICFAI FOUNDATION FOUNDATION

EDUCATION (CACT, 1956)

ONFOR

HYDERABAD

### **Discipline Courses**

Discipline Courses of the Specific branch of B.Tech Program consists of Compulsory Discipline Course (CDC) and Discipline Courses other than Compulsory (DCOC). The Compulsory Discipline Courses (CDC), twelve in number for each branch are to be completed by every student of the branch taking 2 CDCs in the second semester of the second year, and 10 CDCs in the two semesters of the third year of the Program.

Discipline Courses in the category of DCOC, may be taken as electives. A student must take up a minimum of 6 electives to earn the required credits for the completion of the program. Additionally, a student can take up to 4 optional electives. This is however not mandatory. Students can also opt for DCOCs from other branches as electives, provided he/ she completes all the prerequisites for the same.

#### Credits calculation

Each course in the program structure is associated with an LPU (three digits) which describes the nature of the course. The first digit denotes the number of lecture hours per week, the second digit denotes the number of practical hours per week and the third denotes the credits or units given to the course for calculation of CGPA. Wherever, a single number appears, it indicates the total number of units only; its break-up may be announced through the time table or the Course Handout.

The effort that has to be put in by a student for a course is quantified in terms of 'units'. One unit in a theory course denotes three hours per week of study. This includes one lecture hour and two hours spent towards self-study. One unit in a laboratory-based course denotes two hours per week of laboratory work and one hour of self-study.

For example, a three unit theory course requires students to work on that course for about 9 hours per week. 3 Hrs of formal contact hours/ week + 6 Hrs of self-study outside classroom/ week = 9 Hrs per week.

The eligibility for a degree is determined on the basis of number of units completed. The minimum stipulated number of units for various degree programs are given below

# **Integrated First Degree (First tier)**

B. Tech.	172
B. Sc.	133
B. Sc. – B. Tech Degree	209
B.Tech – B.Tech Degree	243

**Higher Degree (Second tier)** 

M. Tech 90 Ph.D. (Thesis) 40

IcfaiTech - CURRICULUM&SYLLABUS III E, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

HYDERABAD B. Hech. (DS&AI)

# PROGRAM EDUCATIONAL OBJECTIVES, PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

# Program Educational Objectives (PEOs):

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

### **Program Outcomes (POs):**

Program outcomes describe what students are expected to know and would be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program.

# Program Specific Outcomes (PSOs):

Program Specific Outcomes are statements that describe what the graduates of a specific engineering program should be able to do.

# STATEMENTS OF PEOs, POs AND PSOs

# PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

#### PEO1-PROFESSIONAL DEVELOPMENT

To develop in the students the ability to acquire knowledge of Mathematics, Science & Engineering and apply it professionally within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability with due ethical responsibility.

#### PEO2-CORE PROFICIENCY

To provide ability to identify, formulate, comprehend, analyze, design and solve engineering problems with hands on experience in varioustechnologiesusing modern tools necessary for engineering practice to satisfy the needs of society and the industry.

#### PEO3- TECHNICAL ACCOMPLISHMENTS

To equip the students with the ability to design, simulate, experiment, analyze,optimize and interpret in their core applications through multi disciplinaryconcepts and contemporary learning to build them into industry readygraduates.

PEO4- PROFESSIONALISM

IcfaiTech - CURRICULUM&SYLLABUS HE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the USC

HYDERABAD B. Tech. (DS&AI)

To provide training, exposure and awareness on importance of soft skills forbetter career and holistic personality development as well as professionalattitude towards ethical issues, team work, responsibility, accountability, multidisciplinary approach and capability to relate engineering issues tobroader social context.

#### **PEO5- LEARNING ENVIRONMENT**

To provide students with an academic environment and make them aware of excellence, develop the urge of discovery, creativity, inventiveness, leadership, written ethical codes and guidelines and the life-long learning to become a successful professional in Electronics and Communication Engineering.

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 1956

B.Sc (Physics) and B.Tech.(DS&AI)

# PROGRAM OUTCOMES (POs):

PO1	Engineering knowledge	An ability to apply knowledge of mathematics (including probability, statistics and discrete mathematics), science,
	Kilowicuge	and engineering for solving Engineering problems and
		modeling
PO2	Problem analysis	An ability to design, simulate and conduct experiments, as
		well as to analyze and interpret data including hardware and software components
PO3	Design / development of solutions	An ability to design a complex system or process to meet desired specifications and needs
PO4	Conduct	An ability to identify, formulate, comprehend, analyze,
	investigations of	design synthesis of the information to solve complex
	complex problems	engineering problems and provide valid conclusions.
PO5	Modern tool usage	An ability to use the techniques, skills and modern engineering tools necessary for engineering practice
PO6	The engineer and	An understanding of professional, health, safety, legal,
	society	cultural and social responsibilities
PO7	Environment and	The broad education necessary to understand the impact of
	sustainability	engineering solutions in a global, economic, environmental
		and demonstrate the knowledge need for sustainable
		development.
PO8	Ethics	Apply ethical principles, responsibility and norms of the
		engineering practice
PO9	Individual and team work	An ability to function on multi-disciplinary teams.
PO10	Communication	An ability to communicate and present effectively
PO11	Project management	An ability to use the modern engineering tools, techniques,
	and finance	skills and management principles to do work as a member
		and leader in a team, to manage projects in multi-
		disciplinary environments
PO12	Life-long learning	A recognition of the need for, and an ability to engage in,
		to resolve contemporary issues and acquire lifelong learning

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the U

FOR HIG

# PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1	To acquire a coherent and through understanding of the field of Physics by learning the traditional and modern areas like Mechanics, Electrodynamics, Mathematical physics, Condensed matter physics, Laser optics, Modern physics etc., and their connection with related disciplinary areas / subjects like Engineering sciences, Mathematics, Environmental sciences, Information Technology etc.
PSO2	To obtain procedural knowledge that creates different types of professionals, well versed in Physics and related disciplines to be engaged in research & development and teaching.
PSO3	Be aware of the importance of mathematical modelling simulation and computation. To appreciate the role of mathematical and approximation methods in helping us understand the way in which physical world works.
PSO4	To acquire skills required to plan and execute experiments/investigations related to the discipline and to analyse and interpret the acquired data using appropriate tools and prepare a report accurately depicting the methodology, the findings and the conclusions.
PSO5	To acquire and demonstrate problem-solving skills, independent thinking to solve Physics-related problems and obtain well-defined solutions. To develop an open mind to expand the boundaries of ones understanding of Physics to tackle openended problems in the inter-disciplinary areas. To acquire analytical skills to construct logical arguments. To develop an ability to comprehend research texts and papers and to develop communication skills to present scientific papers/ results in a compact form to audience groups of various competency levels. To acquire ability to deconstruct difficult scientific concepts/results into simpler parts in order to disseminate the scientific progress to the general public.
PSO6	To acquire an ability to adapt to the rapid changes taking place due technological and scientific developments. To develop an understanding on the impact of these advances on the society and ecology.
PSO7	To acquire an ability to function independently or in a team and to work in a multi-disciplinary work environments. To develop interpersonal and leadership skills to lead a team. To learn to respect intellectual property rights and help in promoting a safe environment for learning and working by following ethical professional behavior.

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1957)

IcfaiTech - CURRICULUM&SYLLABUS, 1FHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)



# B.Sc (Physics) and B.Tech.(DS&AI) Integrated Dual Degree Program Structure

Year	Course Code	Semester-I	L	P	U	Course Code	Semester-II	L	P	all the
	IPDCHEM 111	Chemistry	3	0	3	IPDES121	Thermodynamics	3	0	3
	IPDEGL112	English Language Skills	3	0	3	IPDAO122	Probability and Statistics	3	0	3
	IPDMATH113	Linear Algebra	3	0	3	IPDMATH123	Higher Calculus	3	0	3
1	IPDPHY114	Physics I	3	0	3	IPDPHY124	Physics II	3	0	3
	IPDTA115	Engineering Graphics	2	4	4	IPDTA125	Scientific Measurements	0	4	2
	IPDTA116	Computer Programming I	3	0	3	IPDTA126	Workshop Practice	2	4	4
	IPDEVS117	Environmental Science	2	0	2	IPDTA127	Computer Programming II	3	0	3
	To	otal No of Credits			21	То	otal No of Credits			21
		Semester-III	رگیر				Semester-IV			
	IPDES211	Electrical Sciences I	3	0	3	IPDES221	Electrical Sciences II	3	0	3
	IPDES212	Digital Electronics	2	2	3	IPDTA222	Engineering Measurements	1	8	4
	IPDES213	Engineering Mechanics	3	0	3	IPDTA223	Professional Communication	3	0	3
п	IPDECON214	Principles of Economics	3	0	3	IPDMGTS224	Principles of Management	3	0	3
	IPDMATH215	Complex Variables	3	0	3	IPDAO225	Optimization Techniques	3	0	3
	IPDMATH216	Differential Equations & Fourier Series	3	0	3	IPDES226	Structure & Properties of Materials	3	0	3
	PHY211	Optics	3	0	3	PHY221	Partial Differential Equations & Systems of ODEs	3	0	3
	To	otal No of Credits			21	То	otal No of Credits			22
		Summer	Term	Intern	iship Pro	ogram IP 221				5
		Semester-V	N. P.				Semester-VI			
	PHY311	Solid State Physics	3	0	3	IPDAO311	Numerical Methods	3	0	3
	PHY312	Introductory Quantum Mechanics	3	0	3	IPDAO312	Control systems	3	0	3
	PHY313	Classical Electrodynamics	3	0	3	-	Humanities Electives (2)			6
III	PHY314	Introduction to Statistical Mechanics	3	0	3	-	Elective	3	0	3
	PHY316	Instrumental Methods of Analysis	1	6	4	IPDPHY321	Atomic Molecular & Nuclear Physics	3	0	3
	PHY317	Introduction to Monte-Carlo Methods	3	0	3	DS221	Data Structures	2	2	3
	DS211	Discrete Structures for Computer Science	3	0	3					
	Te	otal No of Credits			22	To	otal No of Credits			21
		Semester-VII	mi-s	100			Semester-VIII	nt j		
Ĭ	DS311	Artificial Intelligence	3	0	3	DS321	Machine Learning	3	2	4
	CS312	Operating Systems	3	2	4	DS322	Expert Systems	3	0	3
	DS313	Introduction to Data Science	3	0	3	CS323	Computer Networks	3	0	3
IV	DS314	Data Warehousing and Mining	3	0	3	DS324	Neural Networks & Fuzzy Logic	3	0	3
	-	Elective (1)	3	0	3	=	Elective (1)	3	0	3
	( <u></u> )	Humanities Elective	3	0	3	1000	Special Project	0	0	3
	Te	otal No of Credits			19	То	otal No of Credits			19
	Semester-IX						Semester-X			
	IP401 /	Internship Program-II			20		Electives (5)			10
v	TS401	Thesis			20		Humanities Elective (1)			18
V		Electives (5)			1.0	1P401 /	Internship Program-II			20
		Humanities Elective (1)			18	TS401	Thesis			20
										10/20
	To	otal No of Credits	183	V- 1/2	20/18		otal No of Credits			18/20

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabau

B.Sc (Physics) and B.Tech.(DS&A1)

Table: Compulsory Discipline Courses for the BSc Physics

Physics							
Course Code	Course Title	L.	P	U			
PHY211	Optics	3	0	3			
PHY221	Partial Differential Equations & Systems of ODEs	3	0	3			
PHY311	Solid State Physics	3	0	3			
PHY312	Introductory Quantum Mechanics	3	0	3			
PHY313	Classical Electrodynamics	3	0	3			
PHY314	Introduction to Statistical Mechanics	3	0	3			
PHY315	Atomic Molecular & Nuclear Physics	3	0	3			
PHY316	Instrumental Methods of Analysis	1	6	4			
PHY317	Introduction to Monte-Carlo Methods	3	0	3			

Table: Discipline Core Courses for the B.Tech. Programs

THE WAY THE	Data Science and Artificial Intelligence (DS	& AI)	30	
Course Code	Course Title	L	P	U
DS211	Discrete Structures for Computer Science	3	0	3
DS221	Data Structures	2	2	3

Table: Compulsory Discipline Courses for the B.Tech Programs

	Data Science and Artificial Intelligence (	DA & AI)		
Course Code	Course Title	L	P	U
DS311	Artificial Intelligence	3	0	3
CS312	Operating Systems	3	2	4
DS313	Introduction to Data Science	3	0	3
DS314	Data Warehousing and Mining	3	0	3
DS321	Machine Learning	3	2	4
DS322	Expert Systems	3	0	3
CS323	Computer Networks	3	0	3
DS324	Neural Networks & Fuzzy Logic	3	0	3

Table: List of electives for B.Tech. (Data Science and Artificial Intelligence)

# 1) Data Science Specialization

Course Code	Course Title	L	P	U
DS401	Predictive Analytics	3	0	3
DS402	System for Data Analytics	3	0	3
DS403	Data Visualization	3	0	3
DS404	Big Data Systems	3	0	3
DS405	Real Time Analytics	3	0	3

HOR HIGHER

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 195-

B.Sc (Physics) and B.Tech.(DS&AI)

### 2) Artificial Intelligence Specialization

Course Code	Course Title	L	P	U
DS406	Natural Language Processing	3	0	3
DS407	Soft Computing	3	0	3
DS408	Human Computer Interaction	3	0	3
DS409	Computer Vision	3	0	3

### 3) Cloud Computing Specialization

Course Code	Course Title	L	P	U
DS410	Distributed Cloud Computing	3	0	3
DS411	Internet of Things	3	0	3
DS412	Security & Privacy in Cloud Computing	3	0	3
DS413	Cloud Administration	3	0	3

# 4) Blockchain Specialization

Course Code	Course Title	L	P	U
DS414	Fundamentals of Blockchain Technology.	3	0	3
DS415	Ethereum & Solidity Programming Essentials	3	0	3
DS416	Blockchain with Artificial Intelligence	3	0	3
DS417	Blockchain with IoT	3	0	3

# 5) Table: Electives for B.Sc. (Physics)

Course Code	Course Title	L	P	U
PHY323	Classical Mechanics	3	0	3
PHY324	Nanotechnology	3	0	3
PHY325	Special Theory of Relativity	3	0	3
PHY326	Introduction to Acoustics	3	0	3
PHY327	Introduction to Quantum Computation	3	0	3

# 6) List of Humanities Electives

Course Code	Course Title	L	P	U
HS311	Dynamics of Social Change	3	0	3
HS312	Introduction to Psychology	3	0	3
HS313	Heritage of India	3	0	3
HS314	Modern Political Science	3	0	3
HS315	Public Administration	3	0	3
HS316	Professional Ethics	3	0	3

IcfaiTech - CURRICULUM&SYLLABUS, If The, Hyderab

B. Schysics) and B. Tech. (DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC AC 56)

# 3. B.Tech Program Course Description

# **Semester-wise Institute Courses**

Course Code	Course Title	L	P	U	Course Description
IPDCHEM111	Chemistry	3	0	3	Coordination Chemistry: Effective atomic number, Nomenclature of coordination compounds, Shapes of dorbitals, Valence Bond Theory, Magnetism, Crystal Field Theory of Octahedral Complexes, Tetragonal distortions of Octahedral Complexes (Jahn-Teller Distortions), Square Planar and Tetrahedral Complexes, Thermodynamics-First Law: Work and Heat, Internal Energy and Enthalpy, Thermo chemistry: Enthalpy changes accompanying physical change and chemical change e.g. Thermodynamics -Second Law: Entropy and 2nd Law, The Gibb's Free Energy, Phase equilibria: Pure substances The thermodynamics of phase transition, Phase diagrams, Phase diagrams of typical materials Principles of chemical equilibria: The reaction Gibb's energy, Reactions at equilibrium, The response of equilibria to the conditions Consequences of equilibrium: Proton transfer equilibria, Salts in water, Solubility equilibria, Common ion effect Electrochemistry: The migration of ions, Electrochemical cells. The cell potential. Application of standard potentials, The rates of reactions: Empirical chemical kinetics, Reaction rates Temperature dependence of reaction rates.
IPDEGL112	English Language Skills	3	0	3	Familiarizing students with basic English sound system to enhance their power of articulation. It provides intensive practice and extensive exposure to listening speaking, reading and writing Skills. It would enhance not only their comprehensive knowledge of vocabulary but also strengthens their all four skills. The design and content of the course are aimed at making students gain language proficiency and also improve their communication skills
IPDMATH113	Linear Algebra	3		3	Isomorphism between Matrices and Linea Transformations, Representation of Linea Transformations, Representation of Linea Transformations by Matrices, Eigen values, Eigen vectors, Diagonalization, Quadratic forms, Canonic forms.
IPDPHY114	Physics I	81	3	0	Momentum and impulse; two and many particle system Rotational kinematics and dynamics; work and energy current on principles; oscillations and wave motion

icfaiTech – CURRICULUM SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UGC ACT, 1956)

Course Code	Course Title	L	P	U	Course Description
					interference, diffraction and polarization.
IPDTA115	Engineering Graphics	2	4	4	Angle of projections; free hand sketching; orthographic views; pictorial views; auxiliary views; lines and planes; intersection and development; AutoCAD command and simple drawings using AutoCAD.
IPDTA116	Computer Programming I	3	0	3	Basics of Problem solving, Solve with an example, Introduction to python, Data Types, Python Program Flow Control, Python Sequences, Python Functions, Python Modules, Python Packages, Python Object Oriented Programming, Exception Handling, My First Cloud Program - Powered by AWS (Cloud Inventor): Overview of computer and internet, Introduction and basics of cyber security, General idea of data analysis, Basics of programming and algorithms, Overview of computing, Introduction to cloud computing, Overview of cloud models, General idea of cloud computing, Problem solving – Case Study
IPDEVS117	Environmental Science	2	0	2	Meaning of Environment, Types and components of environment, nature and scope of the subject, Need for environment studies, goals of environmental education, environmental education programs. Man-environment relationship, biogeochemical cycles. Concept of ecology, subdivisions and developmental phases of ecology; concept of the ecosystem, Structural and functional aspects of ecosystems; Productivity concept of ecosystem, food chains & food webs in ecosystems. Ecological energetic, ecological interactions. Population ecology, Population dynamics Soil, Land use patterns, Waste lands, Desertification, Water resources, Air resources, Energy resources, Waste management, Waste water management, Biomedical waste management, Environmental policies and laws
IPDES121	Thermodynamics	3	0	3	Concepts and laws of thermodynamics; macroscopic thermodynamic properties; application to closed and open system; microscopic approach to entropy; equations of state; thermodynamics of non reacting mixtures.
IPDAO122	Probability & Statistics	3	0	3	Probability spaces; conditional probability and independence; random variables and probability distributions; marginal and conditional distributions; independent random variables; mathematical expectations; mean and variance; binomial; Poisson and distributions; sum of independent random variables; law of large numbers; central limit theorem (without proof); sampling distributions.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabach HYDERABAB Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT

Course Code	Course Title	L	P	U	Course Description
					Cylindrical and spherical coordinates, Jacobian, Limits, Continuity and Differentiability of vector functions, Velocity & unit Tangent vector, Normal vectors, Curvature, Torsion and the Bi normal, Tangential & normal components of velocity and acceleration, Functions of several variables, Limits and continuity in higher dimensions, Partial derivatives, differentials, linearization, Taylors formula for two variables, Chain rule for derivative, Directions derivatives, Gradient and Tangent planes, Maxima, Minima with application Convergence of sequences and series, Maclaurin, s Series, Taylors series, Vector calculus inRn, Vector analysis, Theorem of Green Gauss and Stokes  Electrical fied; magnetic field; electric current;
IPDPHY124	Physics II	3	0	3	electromagnetic induction; Max well's equation; Electromagnetic waves; wave particle duality; uncertainty principle and Bohr model of atom.
IPDTA125	Scientific Measurements	0	4	2	A laboratory course that covers the lab components associated with six core science courses in the integrated first degree structure. While the exact component and assignments may vary from time to time. The assignments would invariably be illustrative of the theory covered in this portion as well as aim to emphasize the aspects of measurement as a theme in experimental science. This course is a compulsory requirement for all students who have to compulsorily do the six core science courses.
IPDTA126	Workshop Practice	2	4	4	Basics of manufacturing processes, Technical and economical considerations of manufacturing. Significance of material properties with respect to selection of manufacturing processes, Fitting & Carpentry, Metal forming processes, Sheet-metal working, Mechanical joining processes, Smithy tools and making various parts, Casting processes, laboratory exercises involving machining, fitting & carpentry joining, CNC, house wiring, foundry and smithy etc.
IPDTA127	Computer Programming II	3	0	3	Java Programming Fundamentals, features of Object oriented programming, primitive data types and operators, various program control Statements Classes, Objects and Methods, more data types and operators, Strings and other Operators, A closer look at methods and Classes, learn and implement Inheritance, Interfaces and Packages, Exception Handling, File I/O, Multithreading, database connectivity, Exploring My Cloud Powered by AWS Essentials in Cloud Computing, Fundamentals of Big Data and Analytics, Introduction to Database Management System, Basics of Web Technologies Basics of Storage and Networking, Cloud Computing Fundamentals and Services, AWS Analytics and Database Services, AWS Developer and Management Tools, AWS Strings Services, AWS Networking and
THE ICE	CURRICULUM STATE BY REGISTRAR FAI FOUNDATION FOR HIGHER TO be University Under Section 3 of the	FDil	(SATIC	W.	120

Course Code	Course Title	L	P	U	Course Description
					Content Delivery Services.
IPDES211	Electrical Sciences	3	0	3	Introduction; basic circuit elements; sources (dependent and independent); Kirchoff's current and voltage law, source representation and conversion; Network theorems, response of RL,RC and RLC circuits; sinusoidal steady state analysis of circuits; three phase circuits, transformers; basics of rotating machines; DC machines; induction machine
IPDES212	Digital Electronics	2	2	3	Number systems and machine representation, Boolean algebra, minimization techniques, combinational and synchronous sequential circuits, logic minimization, programmable logic devices, state table and state diagrams, digital integrated circuits, asynchronous circuits, arithmetic operations and algorithms. The course will also consist of laboratory practice
IPDES213	Engineering Mechanics	3	0	3	Introduction, System of Forces; Laws of Mechanics; Types of Supports and their reactions; Equilibrium of rigid bodies; Force resolution and Resultant force; Friction; Moments and couples; Varignon's Theorem; Center of Gravity; Moment of Inertia, product of inertia, Mass moment of inertia; Dynamics of particles- displacement, velocity and acceleration, D' Alembert's principle; Rectilinear motion; Impulse momentum principle; Impact of elastic bodies; Curvilinear motion; Work-energy principal.
IPDECON214	Principles of Economics	3	0	3	Nature and Scope of economic science, its relationship with other social sciences; quantification of economic variables, theories of consumer behavior and of the firm; linear economic models; market structures; social accounting and basic elements of economic planning
IPDMATH215	Complex Variables	3	0	3	Regions in the Complex plane, Functions of Complex Variable, limits. Mappings, Theorems on limits, Continuity, Derivatives, Cauchy-Riemann equations, Analytic Functions, harmonic functions, Exponential logarithmic functions, complex exponents, Trigonometric, Hyperbolic functions and their inverses, Contour integrals, Anti derivatives, Cauchy theorem, Cauchy Integral Formula, Morera's theorem, Liouville's Theorem, Maximum Modulus Principle, Convergence of sequences of series, Taylor's and Laurent series, Residues poles and zeros of analytic functions, Applications of residues, Conformal mapping, Fourier Transforms and Z Transforms.
IPDMATH216	Differential Equations & Fourier Series	3	0	3	First order differential equations, Reduction of order Second order equations with applications bending of beams and electrical circuits, The homogeneous equation with constant coefficients and the Method of Undetermined Coefficients, Variation of parameters, Higher order linear equations, Power series solutions and ordinary points Frobenius Method & Regular singular points, Gauss' hypergeometric countion, Legendre polynomials & Besse

IcfaiTech - CURRICULUM&SYLLABUS, TFHE, Hyderalized HYDERABAD, Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the IIGC ACT, 1954)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

Course Code	Course Title	L	P	U	Course Description
					functions, Laplace Transform & Inverse Laplace Transform, Convolution of Laplace Transform & application to differential equations, Fourier series and convergence, Cosine and Sine series, Sturm-Liouville problem, one dimensional Heat and Wave equations and Laplace equations in rectangular form.
IPDES221	Electrical Sciences	3	0	3	Semiconductor physics, doped semiconductors, junction diode, ideal diode, non-ideal diode models, Zener diode and their applications, effects of capacitance, PNP transistor, NPN transistor, cut off and saturation, application to digital logic circuits, Junction Field effect transistors, MOSFETs, MOSFET Logic gates, Complementary MOSFETs, BJT Amplifiers, FET amplifiers biasing and small signal analysis, Frequency response, power amplifiers, IC amplifiers, Operational amplifiers
IPDTA222	Engineering Measurements	1	8	4	Measurement of basic electrical and non-electrical quantities; system performance measurements; analysis of experimental data. The course shall aim to train the student in the skill of operation of instruments in the electrical and electronics, chemical, civil and mechanical engineering applications. Precise lab exercises will be prescribed from time to time.
IPDTA223	Professional Communication	3	0	3	Basics of Communication; Verbal and Non-verbal Communication; Barriers to Communication; Business Correspondence; E-mail Communication; Memo-Reports; Notice, Agenda and Minutes of Meetings; Effective Writing; Report: Its Features: Types of Reports; Formal Reports; Gathering Information; Organization of the Material; Uses of Visual Aids; Writing Abstract and Summaries; Writing Definitions; Reading and Listening Skills; Note-making; Précis Writing; Audio Visual Aids; Oral Presentation; Editing; Mechanics of Writing.
IPDMGTS 224	Principles of Management	3	0	3	Fundamental concepts of management-planning- organizing; staffing; directing and controlling; production, financial, personnel, legal and marketing functions; accounting and budgeting, balance sheets.
IPDAO225	Optimization Techniques	3	0	3	Optimization of functions of one and more variables with and without constraints, Kuhn-Tucker conditions, Gradient Methods, Linear Programming, Simplex based and integer programming methods, Duality Theory, Transportation and assignment problems, Dynamic programming, Branch and bound methods, Models of linear production systems
IPDAO311	Numerical Methods	3	0	3	Solution of non-linear algebraic equations; interpolation and approximation; numerical differentiation and quadrature; solution of ordinary differential equations;

HYDER B.Sc Hysics) and B.Tech.(DS&AI) IcfaiTech – CURRICULUM & STELABUS, IFHE, Hyderabad REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION

(Deemed to-be-University Under Section 3 of the UGE ACT ACT

Course Code	Course Title	L	P	U	Course Description
					system of linear equations; matrix inversion; Eigen-value and Eigenvector problems.
IPDAO312	Control Systems	3	0	3	Mathematical models of physical systems, feedback characteristics of control systems, control system components, time response analysis, stability, frequency response, state-space analysis
HS311	Dynamics of Social Change	3	0	3	Nature of Society, social institutions; concept and nature of socio-cultural change, obstacles, rate and direction o change; factors of social change ideological, economic technological and political demographics; agencies o social change-education, leadership, propaganda legislative reforms; five-year plans and social change peasant and land reform, bhoodan and gramdan; changing pattern of family, marriage, caste and religion
HS312	Introduction to Psychology	3	0	3	The development of psychology as a science individua and the environment; nature; kinds and determinants of perceptions; response mechanism and kinds of responses motivations, modifications of behaviour through learning memory and transfer of training; thought process problem solving and creative thinking; nature and evaluation techniques of intelligence and personality.
HS313	Heritage of India	3	0	3	Foundations of India; India and its ancient culture; life of the people; systems of Indian philosophy; art and archeology; languages and literature; impact of world civilization; Western influence.
HS314	Modern Political Science	3	0	3	Nature and scope of political science; emergence an basis of the state; rights and duties; forms of government democracy, fascism, capitalism, socialism, anarchism communism, Maoism, radicalism and Gandhism.
HS315	Public Administration	3	0	3	Definition, nature and scope of public administration; the chief executive; leadership qualities of an administrator principles of organization; organization of Ministries of Home and Finance; personnel administration bureaucracy; recruitment, promotion, conduct and discipline, employer employee relations; administration at work-planning, policy formulation, decision making supervision, coordination; integrity in administration public corporations in India; financial administration in India; local administration in India.
HS316	Professional Ethics	3	0	3	Ethics, nature and purpose; ethical theories; ethics i business and management; ethics in engineering, globa ethical issues.
DS491 CE491 CS491 EC491 EE491	Special Projects	0	0	3	This is an unstructured open ended where under the overall supervision of an instructor-in-charge, batches of students will be attached to different instructors. Each batch will work on a specific time bound which is of basic or peripheral concern of student's discipline. Each student must submit a project report as a culmination of his endeaver and investigation. The instructor-in-charge will determine the choice of the project and also whether not the project report is to be submitted jointly by

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the USC ACT, 19)

Course Code	Course Title	L	P	U	Course Description
ME491 MEC491					group or individually by a student. This course will aim to evaluate the student actual ability to use the fundamentals of knowledge and to meet the new unknown situations as demonstrated by the student's interaction with the instructors and instructor-in-charge. The instructor-in-charge may assign specific hours of formal brain storming sessions.

IcfaiTech – CURRICULUM SYLLABUS, IFHE, Hyderabad REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the USC ACT, 195)

B.Sc (Physics) and B.Tech.(DS&AI)

LEAST COURT OF HIGHER EFFICATION (Beenedy 1-19)

# B.Sc. Program (Physics)

# **Course Description**

Course Code	Course Title	L	P	U	Course Description
PHY211	Optics	3	0	3	Matrix method in Paraxial optics: Introduction, The Matrix method, Unit planes, Nodal planes and a system of two thin lenses. Wave theory of light, Two beam interference by division of wave front and amplitude Phase change on reflection, Interference in thin films Diffraction; Rayleigh's criterion; Fresnel diffraction polarization; Fresnels Formulae for perpendicular and parallel polarization cases, Reflection & Eamp Transmission coefficients, Brewster's law, Malus law Double refraction, Nicol prism as an analyzer, Huygen's explanation of double refraction in uniaxial Crystals optics axis, Plane, circular and elliptical polarized light Wave plates, optical activity, specific rotation.
PHY221	Partial Differential Equations & Systems of ODEs	3	0	3	Systems of linear differential equations, types of linear systems, differential operators, an operator method for linear systems with constant coefficients, Basic Theory or linear systems in normal form, homogeneous linear systems with constant coefficients(Two Equations in two unknown functions). Simultaneous linear first orde equations in three variables, methods of solution, Pfaffiar differential equations, methods of solutions of Pfaffiar differential equations in three variables. Formation of first order partial differential equations, Linear and non-linear partial differential equations of first order, special types or first-order equations, Solutions of partial differential equations of first order satisfying given conditions. Linear partial differential equations with constant coefficients Equations reducible to linear partial differential equations with constant coefficients, Partial differential equations with variable coefficients, Separation of variables, Non linear equation of the second order.
PHY311	Solid State Physics	3	0	3	Crystal Structure: Lattices, Brillouin Zones, Diffraction o X-rays by Crystals; Lattice Vibrations and Phonons Acoustical and Optical Phonons, Dulong and Petit's Law theories of specific heat of solids. Magnetic Properties o Matter: Classical Theories, Quantum Mechanica Treatment, B-H Curve; Dielectric Properties of Materials Polarization, Electric Susceptibility, Clausius Mosott Equation, Classical Theory of Electric Polarizability Langevin-Debye equation, Complex Dielectric Constant Elementary band theory: Kronig Penny model, Band Gaps, Conductivity of Semiconductors, and Supplementary Conductivity.

PHY313 Classical Electrodyna Introduction	rse Title	L	P	U	Course Description
PHY313 Electrodyna  Introduction	ory Quantum S	3	0	3	The Need for quantum mechanics: Black body radiation, Planck's formula, double slit experiment, quantum theory of light. Postulates of quantum mechanics, Schroedinger picture, Heisenberg picture and Dirac picture, the Schroedinger equation: Time independent Schroedinger equation, Stationary states, eigenvalues and eigen functions, Probability density, Properties of the wave function, Bound State problems: Particle in one, two and three Dimensional Box, Barrier problems, One Dimensional Simple Harmonic Oscillator, Zero Point Energy, Spherically symmetric potentials, quantum theory of angular momentum. Radial Quantization of Energy and Angular Momentum
I DHALLI	namics	3	0	3	Recapitulation of electrostatics, divergence and curl of a vector field, electric potential, work, energy and conductors, introduction of the Dirac delta function, Poisson's equation and Laplace's equation: Boundary conditions and uniqueness theorems, method of images, multipole expansion, Electric field in matter: polarization and dielectrics. Boundary value problems with linear dielectrics. Recapitulation of Magnetostatics: Magnetic fields, magnetic vector potential, multipole expansion, magnetic fields in matter: magnetization torques and forces on magnetic dipoles, Ampere's law. Electrodynamics: electromotive force, electromagnetic induction, induced electric fields, Inductance, Maxwell's equations, modification of Ampere's law, magnetic charge, Maxwell's equations in matter.
	ion to Mechanics	3	0	3	The Statistical Basis of Thermodynamics: The macroscopic and the microscopic states, Gibbs paradox, Elements of Ensemble Theory: Phase space of a classical system, Liouville's theorem and its consequences, The microcanonical ensemble, Quantum states and the phase space The Canonical Ensemble, Equilibrium between a system and a heat reservoir, A system in the canonical ensemble, Equipartition and the virial theorems, A system of harmonic oscillators, The statistics of paramagnetism, Thermodynamics of magnetic systems. The Grand Canonical Ensemble: Equilibrium between a system and a particle-energy reservoir, Physical significance of the various statistical quantities. Simple gas: An ideal gas in a quantum-mechanical microcanonical ensemble, Ideal Bose gas: Thermodynamic behavior of an ideal Fermi gas. Thermodynamic behavior of an ideal Fermi gas. Special topics: One dimensional fluid model-Hard Spheres on a ring, The Ising model in one dimension in the absence of external field

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderahad HYDERABAD

REGISTRAR

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 2) B Physics) and B.Tech.(DS&AI)

La Cobst

Course Code	Course Title	L	P	U	Course Description
PHY315	Atomic Molecular & Nuclear Physics	3	0	3	Atoms and light in a magnetic field, orbital magnetic moments, the Stern-Gerlach experiment, the Vector atom model, properties of electron spin, magnetic resonance, addition of orbital and spin angular momenta, the spin-orbit interaction, the Zeeman effect: Normal and Anomalous, the Pauli exclusion principle, the ground states of atoms and the periodic table, electron antisymmetry, the hydrogen and the helium atoms, Molecules: Rigid diatomic molecules, Rotation, Vibration and electronic Spectra
PHY317	Introduction to Monte- Carlo Methods	3	0	3	Recapitulation of Probability theory, Special probability distributions and Central limit theorem. Statistical errors, Markov Chains and master equations, Random number generators, Simple sampling Monte Carlo methods- Comparisons of methods for numerical integration of given functions, Boundary value problems, Simulation of radioactive decay, Simulation of transport properties, The percolation problem, Generation of 'random' walks, Importance sampling Monte Carlo methods- Ising model, Algorithm, Boundary conditions, Finite size effects, Finite sampling time effects, Critical relaxation. Potts model, Quantum Monte Carlo methods The Ising model in a transverse field, Fermions on a lattice, Continuous time simulations, Monte Carlo simulations at the periphery of physics and beyond-Astrophysics, Materials science, Chemistry, 'Biologically inspired' physics, 'Traffic' simulations, Econophysics, Finance.
PHY323	Classical Mechanics	3	0	3	Review of Newtonian mechanics, Lagrangian mechanics, generalized coordinates, constraints, principle of virtual work, Lagrange's equation, calculus of variations, collisions, and scattering, small oscillations. Hamilton's equations, phase space & phase trajectories, canonical transformations, Poisson brackets, Hamilton-Jacobi theory.
PHY324	Nanotechnology	3	0	3	Nanoscale Systems: Nanostructures, Band structure and density of states of materials at nanoscale, Size Effects, Applications of Schrodinger equation- quantum confinement of carriers in nanostructures and consequences; Synthesis: Top down and Bottom up approach, Gas phase condensation, Vacuum deposition PVD, CVD. Characterization: XRD, Microscopy, Optical properties: Coulomb interaction in nanostructures, Concept of dielectric constant for nanostructures and charging of nanostructure, Electron Transport: Carrier transport in nanostructures, thermionic emission, tunneling and hoping conductivity; Applications: photonic devices, Single electron transfer devices, CNT based transistors. Nanomaterial Devices.

B.Sc (Physics) and B.Tech.(DS&Al) THE ICENT FOUNDATION FOR THE ICENT FOR THE I

IcfaiTech – CURRICULUM & SYLL APUS, IFHE, Hyderabild \*\* NO REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 1956)

Course Code	Course Title	L	P	U	Course Description
PHY325	Special Theory of Relativity	3	0	3	Special Theory of Relativity: Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations, Simultaneity and order of events. Lorentz contraction, Time dilation Relativistic transformation of velocity, frequency and wave number. Relativistic Kinematics, Doppler effect Stellar aberration. Time dilation, four vectors. Relativistic Dynamics, Equivalence of mass and energy. Collision elastic and inelastic. Applications like Mossbauer effect and creation of particles. Field of a moving charge, force and fields near a current carrying wire, invariance of maxwells equations, limitations of special relativity.
PHY326	Introduction to Acoustics	3	0	3	Introduction to acoustics, Human voice, Physiological and Psychological acoustics, Types of acoustics, Propagation of sound: History of acoustics: speed of sound in air liquids and solids, determining frequency, Basic linea acoustics, equations of continuum mechanics and linea acoustics, variational formulations, waves of constant frequency, plane waves, attenuation of sound, acoustic intensity and power, impedance, reflection and transmission, spherical waves, cylindrical waves, simple sources of sound, Integral equations in acoustics waveguides, ducts and resonators, ray acoustics and diffraction. Sound propagation in the atmosphere: Non linear acoustics in fluids, , lossless finite-amplitud acoustic waves, thermoviscous finite-amplitude acoustic waves, shock waves, interaction of non-linear waves bubbly liquids, sonoluminescence and acoustic chao Acoustic signal processing, , Power, energy and power spectrum, statistics, Discrete Fourier transform, The zero transform, Maximum length sequences and Information theory.
РНҮ327	Introduction to Quantum Computation	3	0	3	Dirac notation and Hilbert spaces, dual vectors, linear operators. The spectral theorem, functions of operators. Tensor products, Schmidt decomposition theorem. State of a quantum system, time-evolution of a closed quantum system, measurement in quantum mechanics. Pure an mixed states, density operator, partial trace, general quantum operators. Bloch-sphere representation of single qubit states, qubit rotations, single qubit gates. The quantum circuit model, single and multi-qubit operations universal contents of the con

IcfaiTech – CURRICULUMES XX LABUS, IFHE, Hyderabad
RESISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the 1/16C &CT, 3.96)

Course Code	Course Title	L	P	U	Course Description
					approximating unitary transformations, implementing measurements with quantum gates. Probabilistic versus quantum algorithms. Phase kick-back. The Deutsch and Deutsch-Jozsa algorithms. Quantum phase estimation and quantum Fourier transform, error analysis inarbitrary phase estimation. Finding orders, Shor's algorithm for order estimation. Quantum algorithms based on amplitude amplification, Grover's quantum search algorithm and related topics. Mathematical and physical conceptions of quantum entanglement, entanglement distillation, entanglement of formation. Entanglement in pure and mixed states. No-cloning theorem for quantum states.

IcfaiTech - CURRICULUM&SYLABUS, IFHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UGC ACT

B.S. Physics) and B.Tech.(DS&AI) THE SCHALL COUNTY TO FOR HIGHER STUCKFICH

ON FOR HIGH

HYDERABAD

# B.Tech Data Science and Artificial Intelligence Program (DS & AI)

**Course Description** 

Course Description						
Course Code	Course Title	L	P	U	Course Description	
DS211	Discrete Structures for Computer Science	3	0	3	Introduction to discrete mathematical structures; Formal logic and predicate calculus; Sets, relations and functions; Proof techniques; Graphs and trees; Primes, factorization, greatest common divisor, residues and application to cryptology; Boolean algebra; Permutations, combinations and partitions; Recurrence relations, and generating functions; Introduction to error-correcting codes; Formal languages and grammars, finite state machines.	
DS221	Data Structures	2	2	3	Introduction to Software Design Principles- Modularity, Abstract Data Types. Data Structures And Algorithms. Analysis Of Algorithms. Linear Data Structures – Stacks, Arrays, Lists, Queues And Linked List. Representations-Pre-Fix, In-Fix and Post-Fix Expressions. Recursion. Set Operations. Hashing and Hash Functions. Binary and Other Trees. Traversal Algorithms. Huffman Codes. Search Trees. Priority Queues. Heaps and Balanced Trees. Sorting Techniques. Graphs and Digraphs. Algorithmic Design Techniques. Data Structures for External Storage. Multi-Way Search and B-Trees.	
DS311	Artificial Intelligence	3	0	3	Introduction to the problems and techniques of A.I. along with the application of A.I. techniques to the fields like natural language understanding, image processing, game theory and problem solving. The course also aims at understanding its implementation using LISP and PROLOG languages.	
CS312	Operating System	3	2	4	Introduction to Operating Systems. Various Approaches to Design of Operating Systems. Overview of Hardware Support for Operating Systems. Process Management. Process Synchronization and Mutual Exclusion. Inter-Process Communication. Process Scheduling. CPU Scheduling Approaches. Memory Management- Paging, Segmentation, Virtual Memory, Page Replacement Algorithms. File Systems- Design and Implementation of File Systems. Input/Output Systems. Device Controllers and Device Drivers. Security And Protection. Case Studies on Design and Implementation of Operating System Modules.	
DS313	Introduction to Data Science	3	0	3	Introduction to DBMS, ER Modeling, Functional Dependencies, Normalization, DDLs, DMLs, Views, OLTP, Database Integrity, Concurrency. Introduction, Statistical Inference, Exploratory Data Analysis and the Data Science Process, Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study, Linear Regression - k-Nearest Neighbors (k-NN) - k-means, Feature Generation and Feature Selection, Recommendation Systems, Principal Component Analysis, Mining Social-Network Graphs	

IcfaiTech – CURRICULUM SYLLABUS, IFHE, Hyderabad
REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UGC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

					Visualization, Data Science and Ethical Issues.
DS314	Data Warehousing and Mining	3	0	3	Basic Concepts, Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP. Knowledge Discovery Process – Data Mining Techniques, Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Datasets – Introduction, Introduction to WEKA.
DS321	Machine Learning	3	2	4	Introduction, Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation, Linear regression, Decision trees, overfitting, Instance based learning, Feature reduction, Collaborative filtering based recommendation, Probability and Bayes learning, Logistic Regression, Support Vector Machine, Neural network, introduction to deep neural network, Computational learning theory, PAC learning model, Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model.
DS322	Expert Systems	3	0	3	The nature of Expert Systems. Types of applications of Expert Systems; relationship of Expert Systems to Artificial Intelligence and to Knowledge-Based Systems, Distinguishing features of Expert Systems. Benefits of using an Expert System. Choosing an application, Theoretical Foundations Basic forms of inference abduction; deduction; induction, The representation and manipulation of knowledge in a computer. Rule-based representations (with backward and forward reasoning); logic-based representations (with resolution refutation); semantic and partitioned nets (query handling), Handling of uncertainties, Truth Maintenance Systems, Expert System Architectures, An analysis of some classic expert systems, Limitations of first generation expert systems, Deep expert systems
CS323	Computer Networks	3	0	3	Introduction to network, OSI Reference model, TCP/IP Reference Model, Physical layer, Datalink Layer, Network layer, Transport Layer, Session Layer, Presentation Layer, Application Layer.
DS324	Neural Networks & Fuzzy Logic	3	0	3	Introduction: Overview of Artificial Neural Networks. Basic definitions of neuron, Comparison study of humar neuron and artificial neuron, learning, types of learning ANN, Recurrent NN, Perceptron, Single layer and Multi-Layer Perceptron, Multilayer Feedforward Neura networks with Sigmoidal activation functions, Back propagations algorithm, Representational abilities of feedforward networks, Case Study, Backpropagation in Practice, Analysis of pattern Association Networks Analysis of Pattern Classification Networks, Fuzzy setheory. Diffication etc.

B.Sc (Physics) and B.Tech.(DS&AI)

IcfaiTech - CURRICULUM&SYLABUS, IFHE, Hyderabad NOIL

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deamed to be University Under Section 3 of the USC ACT, 1950)

DS401	Predictive Analytics	3	0	3	Predictive Analytics Methods, Ability to apply specific statistical and regression analysis methods applicable to predictive analytics to identify new trends and patterns, uncover relationships, create forecasts, predict likelihoods, and test predictive hypotheses, Predictive Analytics Tools: Develop familiarity with popular tools and software used in industry for predictive analytics, especially R, R Studio and R Markdown, The Predictive Analytics Cycle
DS402	System for Data Analytics	3	0	3	Fundamentals of data engineering- data engineering vs data science, data processing concepts – partitioning, replication, grouping and sorting, data locality, Flynn's taxonomy, Task vs data parallelism, databases, parallel vs distributed databases, architecture- performance, distributed computing architecture, processing frameworks,- batch, map-reduce, stream processing, parallel processing, real time processing, cloud fundamentals – virtualization, batch-transactional-continuous workloads, execution model and examples-AWS, Azure etc
DS403	Data Visualization	3	0	3	Value of Visualization, Data and Image Models, Visualization Design, Exploratory Data Analysis, Multidimensional Data, Graphical Perception, Visualization Software, Interaction, Animation, Color, Using Space Effectively.
DS404	Big Data Systems	3	0	3	Introduction to storage, Deriving design space of storage, NoSQL advances using the design space, The periodic table of data structure, Learned cost model, data structure design continuums, fast statistics through synthesis, Neural network synthesis.
DS405	Real Time Analytics	3	0	3	Motivation and challenges of real-time, distributed, fault tolerant data processing, distributed messaging architecture (Apache Kafta), Real time data processing platform: storm, storm basic programming skills, linking spouts, and connecting to the live Twitter API tp [process real lite tweets, Multilanguage capability of stirm (with Python script), case study: Networking fault prediction. This course also helps a student to analyze and understand big data using visuals. Topic include, design principles, Perception, color, statistical graphs, maps, trees and networks, high dimensional data, data visualization tools.
DS406	Natural Language Processing	3	0	3	Language modeling with N-gram, Spelling correction, Neural networks and neural language models, Parts-of-speech tagging, Syntactic parsing, Language semantics, Computational semantics.
DS407	Soft Computing	β	0	3	Introduction Hispit computing, Fuzzy logic, Fuzzy membership functions, Operations on Fuzzy sets, Fuzzy

HYDERABAD Chysics) and B.Tech.(DS&AI)

THE REALISABLE

IcfaiTech – CURRICULUM SYLLABUS, IFHE, Hyderabado RECUSTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UGC ACT, 1956)

DS408	Human Computer Interaction	3	0	3	relations, Fuzzy proposition, Fuzzy implications, Fuzzy inferences, Defuzzification Techniques-Defuzzification Techniques-II, Fuzzy logic controller-I, Fuzzy logic controller-II, Solving optimization problems ,Concept of GA,GA Operators: Encoding, GA Operators: Selection-I, GA Operators: Selection-II,GA Operators: Crossover-I,GA Operators: Crossover-II,GA Operators: Mutation, Introduction to EC-I, Introduction to EC-II,MOEA Approaches: Non-Pareto, MOEA Approaches: Pareto-I, MOEA Approaches: Pareto-II, ANN Architecture.  Introduction, Interactive system design, Model-based Design and evaluation, Guidelines in HCI, Empirical research methods in HCI, Task modeling and analysis, Dialog Design, Cognitive architecture, Design -Case Studies.
DS409	Computer Vision	3	0	3	Introduction to computer vision, fundamentals of image formation, camera imaging geometry, feature detection and matching, stereo, motion estimation and tracking, image classification, scene understanding, and deep learning with neural networks. Finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment, tracking, boundary detection, and recognition.
DS410	Distributed Cloud Computing	3	0	3	Basic concepts of Cloud Computing, Virtual Machines and Virtualization, Cloud Computing services and issues, Service Oriented Architecture, Cloud Programming and S/W environment, File systems, security and cloud applications.
DS411	Internet of Things	3	0	3	Introduction to Internet of Things Introduction-Definition & Characteristics of IoT, Physical Design of IoT- Things in IoT, IoT Protocols, IoT Communication APIs, IoT Enabling Technologies- Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, Introduction, M2M-Difference between IoT and M2M, SDN and NFV for IoT-Software Defined Networking, Case Studies: Renewable Energy Systems, Fleet Tracking, Shipment Monitoring, Remote Vehicle Diagnostics, Agriculture-Smart Irrigation,.
DS412	Security and Privacy in Cloud Computing	3	0	3	Design security architectures that assure secure isolation of physical and logical infrastructures including compute, network and storage, comprehensive data protection at all layers, end-to-end identity. Complexity of risk assessment, Emergence of new business models and implications for consumer privacy, Regulatory compliance, Privacy by design, Using PETs to implement privacy by design, Description of data processing flows, Using PETs, International Telecommunication Union (ITU), International Organization for Standardization (ISO), Organization for the Advancement of Structured Information Standards (OASIS).
DS413	Cloud Administration	3	0	3	Cloud Resource Administration and Provisioning, Scalable and Elastic Administration, Cloud Interoperability & Portability Strategic Policy Design for Cloud Usage and Compliance Business Continuity Strategies and Disaster Recovery for Cloud, Cloud Security Fundamentals,

IcfaiTech – CURRICULUM&SYL ABUS, IFHE, Hyderadad

REGISTRAR

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

					Federated Controls and Strategies for Multiple Cloud and Non-cloud Administration, Performance Measures, Monitoring and Optimization in Production, Cloud Resource Administration and Provisioning.
DS414	Fundamentals of Block chain Technology.	3	0	3	Blockchain Concepts, Blockchain application example, Blockchain stack, From web 2.0 to next generation decentralized web, Domain specific Blockchain application, Blockchain benefits and challenges, Blockchain application templates, Blockchain applications components, design methodology of Blockchain applications. Setting up Ethereum developments tools, Smart Contracts, Decentralized Applications (Dapps), Case Studies, Mining, Whisper, Swarm, Solidity Essentials, case studies and Advanced topics.
DS415	Ethereum and Solidity Programming Essentials	3	0	3	Introduction, History of Ethereum, setting up Ethereum developments tools, Smart Contracts, Decentralized Applications (Dapps), Case Studies, Mining, Whisper, Swarm, hyper-ledger, hyper-ledger fabrics, case studies and Advanced topics, solidity fundamentals, data type, functions etc
DS416	Block chain with Artificial Intelligence	3	0	3	Introduces of two high-impact contemporary emerging technologies for the future of AI and Block chain. Distributed Ledgers and Deep Learning Algorithms, and its implications for the future of artificial intelligence, Deep learning Chain: Future of artificial intelligence for smart networks with intelligence "baked in" the form of Blockchain Distributed Ledgers for confirming authenticity and transferring value, and Deep Learning Algorithms for predictive identification
DS417	Block chain with IoT	3	0	3	Introduction to Blockchain and IoT, Trust building, Cost reduction, Accelerated data exchanges, Scaled security, Decentralise IoT Network, In an IoT network, the blockchain can keep an immutable record of the history of smart devices. This feature enables the autonomous functioning of smart devices without the need for centralized authority. As a result, the blockchain opens the door to a series of IoT scenarios that were remarkably difficult, or even impossible to implement without it.

IcfaiTech – CURRICULUM&SYLLABUS, IFHE, Hyderabad BSc (Physics) and B.Tech.(DS&AI)

THE THE SERVE SHEET EDUCATION AND THE EDUCATION

REGISTEAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 195/

## 4. Institute Core Courses Handouts

Course No:	Course Title: Chemistry	L	P	U
IPDCHEM111	Course Title. Chemistry	3	0	3

## **Course Learning Objectives**

- To integrate the principles of Inorganic, Physical and Industrial chemistry with the relevant domains of core engineering courses offered at B.Tech level.
- To provide a broad foundation in chemistry that stresses scientific reasoning and analytical problem solving with a molecular perspective.
- Provides a comprehensive survey of underlying principles that govern the properties and behavior of chemical systems.
- The student will understand the interdisciplinary nature of chemistry and to integrate knowledge of mathematics, physics and other disciplines to a wide variety of chemical problems.

## **Course Contents**

### **UNIT-I**

Werner's work, recent studies on complexes, Effective atomic number, Nomenclature of coordination compounds, Shapes of d-orbitals, Valence Bond Theory, Crystal Field Theory of Octahedral Complexes, Magnetism, Thermodynamic aspects of crystal field splitting, Tetragonal distortions of Octahedral Complexes (Jahn-Teller Distortions), Square Planar and Tetrahedral Complexes.

## **UNIT-II**

Work and Heat, Internal Energy and Enthalpy, Enthalpy changes accompanying physical change and chemical change, Entropy and 2<sup>nd</sup> Law, Absolute Entropies and 3<sup>rd</sup> Law, The Gibb's Energy, The thermodynamics of transition, Phase diagrams, and Phase diagrams of typical materials, The reaction Gibb's energy, Variation of reaction Gibbs energy with composition, Reactions at equilibrium, The standard reaction Gibbs energy, Equilibrium composition, Equilibrium constant in terms of concentration, The response of equilibria to the conditions, Proton transfer equilibria, Salts in water, Solubility equilibria.

## **UNIT-III**

The migration of ions, Half reactions and electrodes, Reactions at electrodes, varieties of cells, The cell reactions, Cell potential, Cells at equilibrium, standard potentials, The variation of potential with pH, Determination of pH, Electrochemical series, Determination of thermodynamic functions.

### **UNIT-IV**

Empirical chemical kinetics, Reaction rates, Temperature dependence of reaction rates, Reaction schemes and reaction mechanisms.

HYDERABAD

IcfaiTech - CURRICULUM&SV ABUS, IFIIE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 1957)

### **UNIT-V**

Basic industrial processes like distillation, solvent extraction, solid-liquid leaching and liquid-liquid extraction, separation by absorption and adsorption. An introduction into the scope of different types of equipment needed in chemical technology, including reactors, distillation columns, extruders, pumps, mills, Emulgator, Scaling up operations in chemical industry, Introduction to clean technology, Introduction to synthesis, properties and application of nano-materials

## **Text Books:**

- 1. Lee J. D., "Concise Inorganic Chemistry", 5<sup>th</sup> Edition, Blackwell Science, Oxford University Press, New Delhi, 1996.
- 2. Atkins Peter and De Paula Julio, "The Elements of Physical Chemistry", 6<sup>th</sup> Edition, Oxford University Press, New Delhi, 2015.
- 3. Felder R.M., Rousseau R.W. "Elementary Principles of Chemical Processes", Wiley Publishers, New Delhi, 2006.
- 4. Dieter Vollath, "An introduction to synthesis, properties and application of nanomaterials", 2<sup>nd</sup> Edition, Willey, New York, 2013.

## **Reference Books:**

- 1. Levine Ira N., "Physical Chemistry", 5th Edition, Tata McGraw-Hill, 2002.
- 2. Mahan Bruce M. and Mayers Rollie J., "University Chemistry", 4<sup>th</sup> Edition, Addison, Wesley Longman, 1998.
- 3. Huheey James E, Keiter Ellen A and Keiter Richard L., "*Inorganic Chemistry*", 4<sup>th</sup> Edition, Harper Collins College Publishers, 1993.
- 4. Stocchi E, "Industrial Chemistry" Vol-I, Ellis Horwood Ltd. UK.2006.

#### **Course Outcomes**

## Upon successful completion of the course student will be able to:

- Understand the chemical behaviour of matter and materials using fundamental knowledge of their nature (i.e. electrons and intermolecular forces)
- Correlate the concepts of thermodynamics learnt with the study of engineering devices covered in Mechanical Engineering.
- Use fundamental chemical principles to make predictions about reactivity and general properties of materials of the built environment.
- Predict potential complications from combining various chemicals or metals in an engineering setting.
- Apply concepts learnt to the basic requirements of Civil Engineering, particularly focusing to the built environment
- Collect, represent and interpret experimental results accurately and concisely using technical narrative, graphs, and tables.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

HYDERABAD

THE ICFAI FOUNDATION FOR HIGHES FOUCATION
(Desired-to-be-University Union Section 1)



Course No:	Course Title: English Language Skills	L	P	U
IPDELS112	Course Thie. English Language Skins	2	4	4

- Tofamiliarizing learners with aspects of pronunciation to attain intelligibility and grammatical accuracy in spoken and written English.
- To provides intensive practice and extensive exposure to the four basic skills; listening, speaking, reading and writing

## **Course Contents**

### **UNIT-I**

English Sound System: distinction between letters and sounds, classification of English sounds, syllable structure, confusing sounds for practice, words and sentences for practicing vowel contrasts.

Accent Patterns: accentual patterns of single words, accentual patterns of compound words, accent change according to function, sentence accent.

Effective speech: elision of sounds or syllables, addition of sounds or syllables, transposition sounds, pronunciation based on semantics, inflectional suffixes and some common word endings, general suggestions for pronunciation, Pronunciation of consecutive consonants.

Listening skills: hearing and listening, phonetic features of listening, purpose of listening, barrier to listening, guidelines for improving listening.

Art of conversation: small talk, body language, principles of a good conversationalist.

Debate: process of organization, purpose, rebuttal, participating in a debate, preparation for the debate.

Group Discussion: conversation, debate and GD, kinds of groups, importance and features of GD (oral communication skill, leadership skills, intensive listening skills, nonverbal communication clues), strategies of a group interaction, barriers to an effective GD, suggestions for self-improvement.

IcfaiTech - CURRICULUM&SYLLABUS, WHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
Doomed to be University Under Section 3 of the

\* NESC (Physics) and B. Tech. (DS&AI)

### UNIT-II

Uses of dictionary: the meaning, spelling and pronunciation of a word, antonyms and synonyms, grammar, abbreviations and dictionary symbols, use of thesaurus.

Punctuation: end punctuation marks, internal punctuation marks, direct quotation punctuation marks, word punctuation, spacing with punctuation, too much punctuation.

Prepositions and phrasal verbs: prepositions and phrasal verbs prepositions, Idiomatic combinations, phrasal verbs, Vocabulary extension: context clues, word analysis, semantic change, word-formation methods, antonyms, synonyms, one word substitutions.

Effective use of words: word order, words: its meaning, avoid clichés

Common errors in English: errors in using nouns, errors in using pronouns, errors in using prepositions, errors in using verbs, errors in using gerund/infinitive, use an infinitive not a gerund, errors in using adjectives, errors in using adverbs, errors in using conjunction, errors in using punctuation, common errors due to commonly confused words

## **UNIT-III**

Effective use of sentences: unity and emphasis on sentences, coordination and subordination. Paragraph writing: unity, coherence and development of the paragraph, types of paragraphs, paragraph development.

Essay writing: features of an essay, thesis statement, organization of the material, modes of developing essays, Revise and proofread essay, practice essay.

## **UNIT-IV**

Reading Skill: mechanics of reading, types of reading, reading speed.

## **UNIT-V**

Business correspondence: structure and layout of business letters, enquiry letter and important points, complaint and adjustment letters, complaint letter, important points, sales letter.

Resume writing: elements of resume, preparing a resume, writing a job application letter Presentation Skills: Tips for making presentations.

IcfaiTech - CURRICULUMES TLABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the III)

B.Sc (Dysics) and B.Tech.(DS&AI)

## **Text Books:**

1. Koneru. A. (2011). English Language Skills. McGraw Hill

## Reference Books:

- 1. Langan, J. (2010). College writing skills. McGraw-Hill, Eighth Edition.
- 2. Langan, J., & Jenkins, L. (2010). Ten steps to advancing college reading skills. Townsend Press.
- 3. Swan, M. (2016). Practical English Usage 4th edition.

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Develop listening skills to distinguish between letters and sound to use them effectively in speech during standard communication or debates and group discussions.
- Use dictionary and grammar effectively to overcome errors in reading and writing.
- Frame sentences and effectively use while writing paragraphs, essays, business letters and resumes etc.

HYDERABAD ED

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the USC ACT, 195.0)

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR

Course No:	Caura Title Lineau Algebra	L	P	U
IPDMATH113	Course Title: Linear Algebra	3	0	3

- To solve systems of linear equations
- To compute standard forms of given matrices
- To compute eigenvalues and eigenvectors of 3x3 real matrices
- To compute quadratic forms and diagonalize matrices.
- To introduce complex matrices and obtain analogues of real matrix theorems

## **Course Contents**

UNIT-I Matrices, Matrix addition, Vectors and Scalar Multiplication, Matrix Multiplication, Rank of a matrix Symmetric, Skew-symmetric matrices Row Operation, Row Equivalence, Row Reduced Echelon Matrices

**UNIT-II** Linear systems of Equations, Gauss Elimination, Determinant method: Cramer's Rule Solutions of Linear systems, Existence and Uniqueness, Inverse, Gauss-Jordan Method

**UNIT-III** The matrix eigenvalue problem, Determining eigenvalues and eigenvectors, applications

**UNIT-IV** Vector spaces, Linear Independence, Inner product spaces, subspaces Linear Transformations, Algebra of linear Transformations, Isomorphism between Matrices and Linear Transformations

**UNIT-** V Similarity of Matrices, Diagonalization, Quadratic Forms, Canonical forms Complex Matrices and Forms Hermitian, Skew-Hermitian, Unitary matrices and Orthogonal matrices

## **Text Books:**

- 1. Advanced Engineering Mathematics, Erwin Kreyszig ,10<sup>th</sup> Edition, John Wiley & Sons, 2012.
- 2. An Introduction to Linear Algebra, V. Krishnamurthy, V. P. Mainra, J. L. Arora, East West Press, 2002

# **Reference Books:**

- 1. Linear Algebra and its Applications, Gilbert Strang,
- 2. 4<sup>th</sup> Edition, Thomson Brooks, 2006

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Systematically solve sets of linear equations of small size
- Analyse eigenvalue/eigenvector problems and compute the same
- Apply the concept of rank for a variety of problems
- · Perform diagonalization and related operations operations

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabou (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 195-

Course No:	Course Title: Physics I	L	P	U
IPDPHY114	Course Title: Physics-I	3	0	3

Develop an understanding of the basic principles of Mechanics and wave optics and the application of the principles with emphasis on problem solving skills.

### **Course Content:**

## **UNIT I**

Conservation of Momentum: Collisions, Impulse-Momentum Theorem, Conservation of Momentum, Two-body collisions, Complex Motions, Many-particle systems, Center of Mass and Conservation of momentum

### **UNIT II**

Rotational motion: Rotational Kinematics, Relation between linear and angular variables, Torque and Rotational inertia, rolling without slipping, Angular momentum for system of particles, Conservation of angular momentum

## **UNIT III**

Conservation of Energy: Work, Energy and Power, Work-Energy theorem, Conservative forces, Potential energy, Conservation of mech. Energy, Work done by ext. force, Frictional force, Conservation of total energy

## **UNIT IV**

Oscillators and Waves: Simple Harmonic Oscillator, Free, Damped and Forced Oscillations, Types of waves, Traveling waves, Interference of waves, Standing waves etc

### **UNIT V**

Optics: Double-Slit interference, Interference due to thin films, Single Slit diffraction Intensity calculation, Multiple slits, Diffraction gratings, Dispersion and Resolving power

HYDERAB

IcfaiTech - CURRICULUMS VLLABUS, IFHE, Hyderabad

THE ICFA! FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Bross Section 3 of the UGC ACT

B.Sc (Physics) and B.Tech.(DS&AI)

### Text Books:

1. Robert Resnick, David Halliday and Kenneth S. Krane "Physics", Vol. I and II, 5th Edition John Wiley Inc, Singapore, 2002.

## Reference Books:

- 1. Robert Resnick, David Halliday and Jearl Walker "Fundamentals of Physics", 6th Edition, John Wiley Inc, Singapore, 2001.
- 2. Cutnell and Johnson, "*Physics*", 5<sup>th</sup> Edition, John Wiley, Asia, 2001.

## **Course Outcomes**

- Apply conservation of linear momentum to two/many body systems in lab and centre of mass frame of reference.
- Apply conservation of angular momentum to two/many body systems in lab and centre of mass frame of reference.
- Apply the conservation of energy principle and find the work done by a body under the influence of conservative/non-conservative forces.
- Understand the types of oscillations/waves and the fundamental equations governing them.
- Understand the physics of the most important phenomena in wave optics, namely, interference, diffraction.

## **Skill Development:**

This being a first level course, the following aspects are included into the curriculum to enhance the analytical, mathematical and logical thinking abilities of the students. These following tasks will help them to apply physical concepts to various real life situations and areas of engineering and enhance their intuitive abilities with respect to concepts taught in this course.

- 1. Assignments: The course has assignments as a component of evaluation and these are spread over the entire semester. In this, students are given numerical and situational questions are given, related to the concepts taught.
  - a) These will help them to acquire problem solving and critical thinking skills and reasoning abilities allowing them to apply the concepts of physics to real life problems
  - b) Social and organizational skills like time management, team work are the skills which can be acquired

OR HIGH

- 2. Experiments: The scientific measurement course which runs in parallel to this course has experiments related to the concepts taught in the physics courses. The experiments relavent to this course are
  - 1. Graphical analysis
  - 2. Error analysis
  - 3. Simple Pendulum
  - 4. Compound Pendulum
  - 5. Fly wheel
  - 6. Law of parallel fram

IcfaiTech - CURRICUI UM&SYLLABUS, IFHE, Ladernbad

REGISTRAR THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to-be-University Under Section 3 of the 1967 1997



B.Sc (Physics) and B.Tech.(DS&AI)

The skills that can be developed include

- 1. Associating the experiment to the relevant concepts
- 2. Understanding the principles and the working of various equipment and tools used.
- 3. Correct usage of equipment
- 4. data collection and organization
- 5. graphical and numerical analysis of data
- 6. interpretation of experimental results and arriving at conclusions
- 7. Writing a technical report In addition, the social and organizational skills developed are team work, coordination, time management, collaboration and communication.



IcfaiTech – CURRICULUM&SYLLABUS, IFHE, Hyderabad REGYSTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 et the USC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

THE CONTROL OF THE PROPERTY OF

Course No:	Course Title: Engineering Cuenhies	L	P	U
IPDTA115	Course Title: Engineering Graphics	2	4	4

- To enhance the visualization and imagination abilities
- To promote creative thinking for solving engineering problems.
- To take data and transform it into drawings.
- To learn basic Auto CAD skills
- To learn basic Engineering formats

## **Course Contents**

## UNIT-I

Drawing conventions & Practices, Dimensioning, Geometrical terms, bisecting a line, angle, arc. Regular polygons, curves.

Introduction to CAD, limits, toolbars, starting new drawing, saving new drawing, etc. Simple commands like line, circle, polygon, etc and formatting commands, 2D exercises

### **UNIT-II**

First and third angle projections, Multi view drawing from pictorial views. Projections of points, Projection of lines, true lengths, true inclinations, shortest distances between lines.

### **UNIT-III**

Projections of planes, Primary and Secondary auxiliary views, true shapes. Projections of solids inclined to both the planes.

## **UNIT-IV**

Construction of Sectional views of truncated solids, Development of surfaces - Parallel Line method, Radial Line Method, Intersection of surfaces

### **UNIT-V**

Construction of isometric views from orthographic projections, Missing Views- identifying missing Views.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyde

HE ICFAI FOUNDATION FOR HIGHER EDUCATION
Remed to be University Under Section 3 of the UGC ACT, 1956

Se (Physics) and B.Tech.(DS&AI)

## **Text Books**

- 1. Engineering Drawing with an Introduction to AutoCAD, D.A.Jolhe, TMH, 5<sup>th</sup> edition, 2010
- 2. Fundamentals of Engineering Drawing, Warren J. Luzzader & Duff J. M., PHI, 11<sup>th</sup> edition., 2015

### Reference Books

- 1. Engineering Drawing, K. Venugopal, New Age International (P)., 2006
- 2. Engineering Drawing, N.D.Bhatt, V.M.Panchal, Charotar Publishing, 53<sup>rd</sup> edition, 2014
- 3. Engineering Graphics with Auto CAD 2002", James D. Bethune, PHI, 2002

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- To specify units, limits of drawing. It also includes creating and editing 2 D computer geometry, and constructing lines, arcs, chamfers and fillets.
- Draw parallel and perpendicular lines, and to construct circles, arcs, tangencies and curves.
- Apply standard vertical, horizontal, radius, diameter, and other dimensions to an engineering drawing.
- Generate Engineering Drawings using drafting tools
- Visualize geometrical solids in 3D space through exercises in Orthographic Projections
- Draw auxiliary views and isometric views
- Develop the surfaces of geometrical solids

IcfaiTech - CURRICULUM&SYLLARUS, IFHE, Hyderapad

B.Sc (Physics) and B.Tech.(DS&AI)

Deamed to be University Under Section 3 of the

Course No:	Course Title: Computer Programming I	L	P	U
IPDTA116	Course Title: Computer Programming I	3	0	3

- To introduce the basic concepts of UNIX operating systems.
- To understand the fundamentals of Problem Solving.
- To learn how to design and program Python applications.
- To learn how to design object-oriented programs with Python classes.
- To learn how to use exception handling in Python applications for error handling.

### **Course Contents**

### **UNIT-I**

Introduction to UNIX: Multi-programming, Time sharing, personal computer, and UNIX operating system, etc. General Purpose Utilities & File System: cal, date, and echo, etc directory related commands: pwd, cd, mkdir, rmdir, file related commands. Simple and Advanced Filters: head, tail, paste, sort, uniq, grep and sed, etc, Basics of Problem solving: Building blocks of algorithms (statements, state, control flow, functions), notation.

## **UNIT-II**

Algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion), Example: find minimum in a list, insert a card in a list of sorted cards, and Towers of Hanoi etc. **Introduction to python:** History of Python, Need of Python Programming, Applications Basics of Python Programming, Data Types: Declaring and using Numeric data types.

## **UNIT-III**

**Data Types** string data type and string operations, fining list and list slicing, Tuple, string, list and dictionaries **Python Program Flow Control:** if, else and else if, for loop, while loops continue, and break **Python Sequences:** String in build methods, List and dictionary manipulation, Programming using string, list and dictionary

## **UNIT-IV**

**Python Functions:** Organizing python codes using functions **Python Modules:** Organizing python projects into modules, importing own module as well as external modules **Python Packages:** Lambda function, Programming using functions, modules and external packages

IcfaiTech - CURRICULUM& YLLABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Universection 3 of the UGC ACT, 195)



## **UNIT-V**

**Python Object Oriented Programming:** Class, object and instances Constructor, class attributes and destructors, Real time use of class in live projects Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, **Exception Handling:** Avoiding code break using exception handling, Safe guarding file operation is using exception handling, Handling and helping developer with error code.**AWS Educate:** Introduction to Cloud Computing, Overview of Cloud Models, Cloud Inventor Certification.

### **Text Books:**

1. Learning Python, Mark Lutz, Orielly, 5 Edition, 2013.

## **Reference Books:**

- 1. How to Think Like a Computer Scientist: Learning with Python 3, Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, 3<sup>rd</sup> Edition, 2019.
- 2. Fundamentals of Python: First Programs, Kenneth A. Lambert, Cengage, 1<sup>st</sup> Edition, 2011.
- 3. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.
- 4. UNIX Concepts and Applications, Sumitabha Das, TMH, 4th edition, 2006.

## **Course Outcomes**

After successful completion of the course student will be able to

- To execute shell commands in Linux.
- Understand, analyze and solve problems using algorithmic approach.
- Write Python programs using conditional statements, loops and functions.

HYDERABAD

- Use Python data structures lists, tuples, dictionaries.
- Do input/output with files in Python.
- Understand the Importance of cloud computing and its applications.

IcfaiTech – CURRICULUM&SYLLABUS, IFNE, Hyderat
REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER

Openmed to be University Under Section 3 of #

ESc (Physics) and B.Tech.(DS&AI)

end enter a month of othermoral)

Course No:	Course Title: Environmental Science	L	P	U
IPDEVS117	Course Title: Environmental Science	2	0	2

- To understand the fundamentals of environment
- To understand the science of interrelationship between the living organisms and their environment
- To understand the relationship between the population and the environment.
- To have an understanding about the land resources, water resources, air recourses and their pollution, control methods
- To have an understanding about the waste management.
- To know about the environmental policies and laws.

## **Course Contents**

## **UNIT-I**

Meaning of Environment, Types and components of environment, nature and scope of the subject, Need for environment studies, goals of environmental education, environmental education programs, Man-environment relationship, biogeochemical cycles.

## **UNIT-II**

Concept of ecology, Subdivisions and developmental phases of ecology, Concept of the ecosystem, Structural and functional aspects of ecosystem, Productivity concept of ecosystem, food chains and food webs in ecosystems, Ecological energitics, ecological interactions, Population ecology, Population characteristics, Population dynamics, population regulation.

## **UNIT-III**

Nature and importance of soil, Formation of soil, soil properties, Nutrients in soil soil erosion, contamination of soil, Land use, Waste lands, Desertification.Introduction, properties of water, hydrological cycle, Water resources, waste water of India-its future, Water pollution, Pollution of ground water.

### **UNIT-IV**

Origin of the atmosphere, composition of the air, structure of the atmosphere, Air pollution, Effects of air pollution on human health, flora and fauna, Global effects of air pollution.

IcfaiTech – CURRICURATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the HIGH ACT 1954

(Physics) and B.Tech.(DS&AI)

## **UNIT-V**

Energy, sources of energy, conventional and non conventional sources of energy, Waste water management, biomedical waste management, Air pollution control, Environmental policies and laws.

## **Text Books:**

(1) A Text Book of Environment, Agarwal, K.M., Sikdar, P.K and Deb.S.C Mac Millan India Ltd., 2002.

## **Reference Books:**

- (1) A Text Book on Environmental Science, V. Subramanian, Third reprint, Narosa Publishing House, 2005.
- (2) Environment, Raven, Peter H., and Linda R. Berg. 3<sup>rd</sup> ed., Fort Worth: Harcourt College Publishers, 2001.

## **Course Outcomes**

After successful completion of the course student will be able to

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental issues.
- Acquire practical skills; devise methodologies for scientific problem-solving, including familiarity with laboratory and field instrumentation.
- Understand and implement scientific research strategies, including collection, management, evaluation and interpretation of environmental data.
- Design and evaluate strategies, technologies, and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

HYDERABAD TO

IcfaiTech - CURRICULUM&SVI/LABUS, IFHE,

THE ICFAI FOUNDATION FOR HIGHER EDUCATION

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR

Course No:	Carras Titles Thermadynamics	L	P	U
IPDES121	Course Title: Thermodynamics	3	0	3

- To study the properties of pure substances and their use in widely used devices such as steam power plant, fuel cells, refrigerator, Turbine and Pumps.
- To know how to use the thermodynamic tables to identify the phase of a given state of matter and estimate the quality of saturated liquid vapor mixture
- To understand the concept of heat and work and estimate the same at the boundary of real time systems
- To know the application of first law for closed systems and the interpretation of thermodynamic properties such as Internal Energy and Enthalpy and determine their change during a process; To know the application of first law for control volume systems and to understand the transient process
- To know the application of second law of thermodynamics and to know the thermodynamic temperature scale; To understand the concept of entropy and entropy change in solid, liquid and liquids and gases
- To delimit the application of second law for control volume systems and to understand the concept of efficiency of engines

## **Course Contents**

## **UNIT-I**

Introduction to some devices like steam power plant, fuel cells etc.; Thermodynamic system, properties and state, processes and cycles, force, energy, pressure, specific volume, Zeroth law and numerical problems; Phase equilibrium, independent property, compressibility factor; Study of steam tables and solving numerical problems.

## **UNIT-II**

The concept of heat and work: Definition of work, understanding of piston work; Understanding of heat concept, modes of heat transfer and numerical problems on it; Definition of first law, first law for a change of state, internal energy and enthalpy; Specific heat, internal energy and enthalpy of an ideal gas, first law as a rate equation and numerical problems

## **UNIT-III**

Application of first law for control volume systems: Conservation of mass in control volume, first law for a control volume, SSSF process and examples on it viz. Heat exchangers, Nozzles and diffusers, Throttle, Compressor & Pump, Steam Power Plant and Refrigerator; Transient process: Study of USUF process, numerical problems on it

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956

HYDERBISC (Paysics) and B. Tech. (DS&AI)

THE ROPAL FOLLY (Dearneth) (1)

### **UNIT-IV**

Application of second law of thermodynamics: Heat engines and refrigerators, the Clausius and the Kelvin plank statement, reversible and irreversible processes, study of Carnot cycle and efficiency of a cycle; Thermodynamic and ideal gas temperature scale, numerical problems on it

### **UNIT-V**

The concept of entropy: Clausius inequality, study of entropy as a property, thermodynamic property relations, entropy change of reversible and irreversible processes, entropy generation and principle of increase of entropy; Entropy change in solid, liquid and gases, polytropic process, entropy as rate equation, numerical problems; Second law for control volume, study of entropy for both reversible and irreversible processes, principle of increase of entropy; Understanding efficiency and related numerical problems

### Text Books:

1. Fundamentals of Thermodynamics ISV, Sonntag R E & Claus B John Wiley, 7th Edition, 2009.

## **Reference Books:**

- 1. Thermodynamics, P.K.Nag, Tata Mc Graw Hill Publishing Company limited, New Delhi, 3rd Edition, 2004.
- 2. Fundamentals of Engineering Thermodynamics, Michael J Moran and Howard N Shapiro, John Wiley, 5th Edition, 2004.
- 3. Thermodynamics- An Engineering Approach, Yunus A. Cengel and Michael A Boles, Tata Mc Graw Hill Publishing Company limited, New Delhi, 5th Edition, 2006.

### **Course Outcomes**

## Upon successful completion of the course, student will be able to:

- *Identify* and explain the basic concepts of thermodynamics like system, properties and their quantification
- *Calculate* thermodynamic properties using steam tables and *analyze* the processes on T-v diagrams to solve advanced engineering problems
- Explain the concept of thermodynamic work. Calculate and compare work for systems executing different thermodynamic processes or different thermodynamic cycles
- State and apply the first law of thermodynamics for closed and open systems undergoing different thermodynamic processes. Evaluate the performance of steam power plants, refrigeration plants and their components
- Evaluate the feasibility of a thermodynamic cycle using the second law of thermodynamics for typical engineering problems
- Quantify the second law of thermodynamics for a cycle by establishing the inequality of Clausius. Apply the inequality of Clausius and establish the property, entropy of a system. Apply principle of increase of entropy to evaluate the feasibility of a thermodynamic process

NFORA

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hythurabad

THE ICFAI FOUND FOR HIGHER EDUCATION

(Deemed-to-be-University Under Section 2 of the ICC (Trans)

Course No:	Carrage Titles Brokehility & Statistics	L	P	U
IPDAO122	Course Title: Probability & Statistics	3	0	3

- This course introduces the concept of probability and enables the student to become familiar with probabilistic concepts,
- A selected study of discrete & continuous distributions and their characteristics

## **Course Contents:**

## UNIT-I

Sample Spaces and Events, Counting, Probability, The Axioms of Probability, Some elementary Theorems, Conditional Probability, Bayes' Theorem

## **UNIT-II**

Random Variables, The Binomial Distribution, The Hypergeometric Distribution, The Mean and the Variance of a Probability Distribution, Chebyshev's Theorem, The Poisson Distribution, Poisson Processes, The Geometric and Negative Binomial Distribution, The Multinomial Distribution.

### UNIT-III

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Other Probability Densities, the Uniform Distribution, Log-Normal Distribution, Gamma Distribution, Beta Distribution, TheWeibull Distribution.

## **UNIT-IV**

Joint Distributions—Discrete and Continuous, Moment Generating Functions.

## **UNIT-V**

Populations and Samples, The Sampling Distribution of the Mean ( $\sigma$  known), The Sampling Distribution of the Mean ( $\sigma$  unknown), The Sampling Distribution of the Variance, representations of the Normal Theory Distributions.

## **Text Books:**

1. Miller & Freund's Probability & Statistics for Engineers: Johnson Richard A., Eastern. Economy Edition, PHI, 7th Edition, 2006

### Reference Books:

- 1. Mathematical Statistics: Freund, J.E.: Prentice Hall, 6th Edition, 2002
- 2. Applied Statistics and Probability for Engineers: Douglas C. Montgomery, & George
- C. Runger, John Wiley & Sons, Inc., 3rd Edition, 2004

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Calculate probabilities and other relevant quantities by selecting suitable probability distributions.
- Work with certain multivariate distributions and derive marginal and conditional probability distributions.

Course No:	Course Title Higher Calculus	L	P	U
IPDMATH123	Course Title: Higher Calculus	3	0	3

- Use calculus to study the paths, velocities, and accelerations of moving bodies
- To study the applications of derivative motion in space
- To understand the frame of mutually orthogonal unit vectors
- To study the functions of more than one independent variable, the way to graph them
- To understand the idea of directional derivatives and the equations of tangent planes and normal lines
- To find extreme values of functions of several variable
- To find the volume of three dimensional shapes using triple integrals
- To calculate the work done by variable forces alone paths in space and rates at which fluids flow along curves and cross boundaries
- To describe the relationship between the way an incompressible fluid flows across the boundary of a plane region and the way it moves inside the region
- To understand Infinite summations

## **Course Contents:**

#### UNIT-I

Limits, Continuity and Differentiability of vector functions, Velocity & Unit tangent vector, Normal vectors, Curvature, Torsion and the binormal, Tangential & normal components of velocity and acceleration.

## **UNIT-II**

Functions of several variables, Limits and continuity in higher dimensions, Partial derivatives, differentials, linearization, Taylors formula for two variables, Chain rule for derivative, Directions derivatives, Gradient and Tangent planes, Maxima, Minima with application, Polar coordinates: Definition, graphing and conics.

## **UNIT-III**

Double integrals in rectangular coordinates, Double integrals in polar coordinates, Cylindrical and spherical coordinates, Triple integrals in rectangular, cylindrical and spherical coordinates (moments, masses and centroids), Substitution in multiple integrals, Jacobian.

#### **UNIT-IV**

Lines integrals, potential & Conservatives fields, Green's, Gauss, and Stokes theorems, Surface area and surface integrals.

### **UNIT-V**

Infinites series, convergence & divergence, Integral, Comparison & Ratio Tests, Alternating series and absolute Convergence.

IcfaiTech - CURRICULUM SYLLABUS, THE OFFICE AND REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
TO A CONTROL OF THE USE AND THE USE AN

B.Sc (Physics) and B.Tech.(DS&A1)

## **Text Books:**

Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2012.

### **Reference Books:**

- 1. Thomas G.B. and Finney R. L., Calculus and Analytic Geometry, Pearson Education, 11<sup>th</sup> ed., 2008.
- 2. Salas S. L., Einar Hille and Garret J. Etgen, Calculus (One and Several variables), John Wiley, 8<sup>th</sup> Edition, 1999.

## **Course Outcomes**

After successful completion of the course student will be able to

- Students will learn important tools of calculus in higher dimensions.
- Engineering applications will help the student appreciate the role of the course in B.Tech
- Geogebra software exposure for mathematical problem solving
- Students will become familiar with 2- and 3-dimensional coordinate systems.
- Students will also learn how to represent motion of objects in 3D using vector functions, how to represent velocity and acceleration using vector projections into tangential and centripetal coordinates of acceleration, and how to characterize curves in space by computing arc length and curvature.
- For functions of 3D surfaces, students will be able to characterize aspects of surfaces and volumes using partial derivatives and the gradient vector.
- Partial derivatives will also be used to describe approximating tangent planes to points on surfaces, and how to compute derivatives of multi-dimensional function compositions can be performed using a multidimensional version of the chain rule.
- Evaluating Double and Triple Integrals.

IcfaiTech – CURRICUL JM&SYLLABUS, IFHE, Hydevabad

REG STRAR

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UGC ACT, 1956)

Course No:	Course Title: Physics-II	L	P	U
IPDPHY124	Course Title. Filysics-II	3	0	3

Develop an understanding of the basic principles of electromagnetism and the application of the principles with emphasis on problem solving skills.

## **Course Content:**

### UNIT I

Coulomb's law, continuous charge distributions. Electric field of point charges, continuous charge distributions, field lines, point charge and dipole in an electric field. Flux of a vector field, flux of electric field, Gauss' law, its applications, Gauss' law and conductors.

## **UNIT II**

Electric potential, potential due to point charges and continuous charge distribution, calculating field from potential, potential from field, equipotential surfaces, potential of a charged conductor. Types of materials, conductor in an electric field, Ohm's law, Ohmic materials. Capacitance, calculation of capacitance, capacitors in series and parallel, energy storage in an electric field, capacitor with dielectric

## **UNIT III**

Magnetic interactions, magnetic poles, force on a moving charge, circulating charges, force on a current carrying wire, Hall effect, torque on a current loop. Magnetic field due to moving charge, due to current, parallel currents, field of a solenoid, Ampere's law.

## **UNIT IV**

Faraday's law, Lenz' law, motional emf, induced electric fields. Magnetic dipole and force on a magnetic dipole in a non-uniform field, Magnetization, Gauss' law for magnetism. Inductance, calculating the inductance, energy storage in magnetic field

### **UNIT V**

Equations of electromagnetism, Maxwell's equations, induced magnetic fields and Displacement currents. Concept of photons, Thermal radiation, photoelectric effect. Matter waves, de Broglie's hypothesis, experimental verification by Davison and Germer experiment, uncertainty principle.

IcfaiTech – CURRICULUM SYLLABUS, IFHE, Hydera and ESc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUTE

(Deemed to be Universal and Section 3 of the U)

FOR HIG

## **Text Books:**

1. Physics, Robert Resnick, David Halliday and Kenneth S. Krane Vol. 2, John Wiley, 5th ed., 2002.

## **Reference Books:**

- 1. Fundamentals of Physics, Robert Resnick, David Halliday and Jearl Walker, John Wiley, 6th ed., 2001.
- 2. Physics, Cutnell and Johnson, John Wiley, 5th ed., 2001.
- 3. Introduction to Electrodynamics, David J Griffiths, PHI, 3<sup>rd</sup> ed., 2002.

# Course Outcomes

# Upon successful completion of the course student will be able to:

- Understand the main concepts of electromagnetic theory
- Develop the mathematical framework to explore electricity and magnetism
- Apply the mathematical framework quantitatively for solving relevant problems
- Appreciate qualitatively how they play a role in many aspects of daily life.

faiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATIO (Deemed-to-be-University Under Section 3 of the 1/6C ACT, 195 B.Sc (Physics) and B.Tech.(DS&AI)

FEBRURY SE

## Skill development:

Physics-II is a first level course, and the following aspects are included into the curriculum to enhance analytical, mathematical and logical abilities of the students. These following tasks will help them to apply physical concepts to various real life situations and areas of engineering and enhance their intuitive abilities, with respect to concepts taught.

# 1. Assignments:

these will help students acquire problem solving and critical thinking skills, reasoning abilities and allow them to apply the concepts of physics to solve real life problems. Social and organization skills like team work and time management can be acquired through assignments.

The course has assignments as a component of evaluation spread over the entire semester. Students are assigned numericals and situational questions related to concepts taught.

## 2. Experiments:

Scientific measurement course run parallel to the first level Physics courses and has experiments related to the concepts taught.

The experiments relevant to Physics-II are

- Stewart and Gees experiment
- Hall effect
- Solar cell
- LCR circuit
- Plancks constant.
- e/m measurent

The skills that can be developed include associating the experiment to the relevant concept use of various equipments and tools understanding the principles and the working of the equipments used correct usage of the equipments data collection and organization graphical and numerical analysis of data interpretation of experimental results arriving at conclusions technical report writing.

In addition, the social and organizational skills developed are team work, coordination, time management, collaboration and communication.

cfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
Deemed to be University Under Section 3 of the US

B.Sc (Physics) and B.Tech.(DS&AI)

Course No:	Course Title: Scientific Measurements	L	P	U
IPDTA125	Course Title: Scientific Measurements	0	4	2

# • List of Physics experiments:

No.s	Experiments	Duration
1.5	Vernier calipers and Screw gauge	1:40 H
2	Graphical Analysis	1:40 H
3.	Error analysis and Graph drawing	1:40 H
4.	Compound pendulum	1:40 H
5.	Parallelogram law of forces and Lami's Theorem	1:40 H
6.	Dispersive power of the material of the a prism	1:40 H
7.	Fly Wheel	1:40 H
8.	Diffraction Grating	1:40 H
9.	Magnetic Field along the Axis of Current Carrying Coil – Stewart and Gees Method	1:40 H
10	Hall Effect	1:40 H

# • List of Chemistry experiments:

No.s	Name of the Experiment	Duration
1,	Estimation of iron (Fe <sup>+2</sup> ) by Dichrometery	1:40 H
2.	Estimation of copper by Iodometry	1:40 H
3.	pH curve of an Acid Base titration	1:40 H
4,	Dissociation constant of a weak electrolyte by conductometry	1:40 H
5.	Colorimetric estimation of Iron	1:40 H
6.	Estimation of strength of oxalic acid using potassium permanganate as an intermediate solution	1:40 H
7,	Synthesis of Nickel(II)-Dimethylglyoxime complex	1:40 H
8.	Determination of rate constant and activation energy of the given ester catalysed by an acid	1:40 H

FOR HIGH

IcfaiTech - CURRICULUMES LLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed+to-be-University Under Section 3 of the UGC ACT, 1956.

Course No:	Course Title: Workshop Practice	L	P	U
IPDTA126	Course Tille. Workshop Tractice	2	4	4

- 1. To learn how the physical artifacts we use are manufactured and gain technical knowledge and skills.
- 2. The practical knowledge is supplemented by the lectures to provide the knowledge and genesis of various manufacturing processes.
- **3.** To check the dimensional tolerances of machined components and acquire knowledge of handling basic machine tools for different applications.
- **4.** To develop skills required for machining components by advanced manufacturing methods like CNC programming.
- **5.** To analyse the difference between conventional and non-conventional manufacturing processes.

## **Course Contents**

### **UNIT-I**

Basics of Manufacturing: Basics, ethics and safety in workshop, Material properties, fracture, selection, mechanical properties, common engineering materials, Metrology, quality, Inspection measuring and gauging, Limits & fits, Examples.

### **UNIT-II**

Metal Cutting Basics: Metal cutting, Machine tools, Cutting tools, Tool material, Types of tools, Tool geometry, Chips, Cutting fluid, Tool life, Lathe machine tool, Turning and other operations, Operating conditions, MRR, Examples.

## **UNIT-III**

Machine Shop Activities: Introduction to other Machines, tools, operating conditions, Shaping & planing machines, Milling machine, types of milling operations, Operating conditions, Milling operations, MRR, Abrasive machine, abrasives, Grinding, Grinding wheel, Grinding machines, fine finishing operations.

## **UNIT-IV**

Sheet metal working: Production of parts by forming processes, Metal forming processes, rolling, extrusion, forging, Punches and dies, Sheet metal operations.

faiTech - CURRICULUM&SYLLARUS, IEHE, Hyderabad B.Sc (Physics) and B.Tech.(DS&Al)

HYDERABAD

(Deemed to be University Linder Section 3 of the UGC ACT, 1956

### **UNIT-V**

Mechanical joining processes: Production of parts by casting processes, Mechanical joining, Welding (arc, gas), Soldering, Brazing, Fasteners, Examples, Application of Computers in Manufacturing, CNC programming for machining components using co-ordinate system, Automation, Comparison between conventional machines and NC machines.

### Text Books:

1. B S Nagendra Parashar and R K Mittal, Elements of Manufacturing Process, Prentice Hall of India, 2011, 10<sup>th</sup> reprint.

### **Reference Books:**

- 1. Campbell J.S., Principles of Manufacturing Materials and Processes, Tata Mc-Graw-Hill, New Delhi, 1999 print.
- 2. Serope Kalpakjain, Steven Schmidt, Manufacturing Engineering and Technology, Pearson, 7<sup>th</sup> Edition, 2014.

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- The course will provide an overview of the techniques and applications of basic manufacturing processes used for producing finished articles from raw materials.
- The course is practice-orientated and requires that basic skills in handling of tools, machines and machine tools used in different manufacturing processes are acquired through the hands-on experience.
- Much of the knowledge in the course is conceptual and this knowledge will be useful in whatever discipline the students are going to specialize.

- CURRICULUM SYLTABUS, IFHE, HARLANDE

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION

Chesmachto-be-University Under Section 3 of the UGC ACT, 195/

Course No:	Course Title: Computer Programming II	L	P	U
IPDTA127	Course Tide. Computer Trogramming II	3	0	3

- To introduce object-oriented programming (OOP) using the Java programming language.
- To learn how to use the Java SDK environment to create, debug and run simple Java programs.
- To introduce Arrays, Abstract Classes, Exception Handling, File I/O and Multithreading.
- To provide hands-on experience in developing Java applications using database connections.

## **Course Contents**

### **UNIT-I**

Introduction to Java: Java Development Kit, Keywords, Identifiers, Class libraries, Key Attributes of OOP, Primitive Data types, Literals, Variables, Scope and lifetime of variables, Operators, Type casting, Operator precedence, Expressions. If Statement, Loops, Nested loops. Class Fundamentals: Objects, Reference Variables and Assignment, Methods, Constructors, Parameterized Constructors, new operator, Garbage collection, finalizers, and this keyword.

## **UNIT-II**

Arrays: Multidimensional arrays, Alternative Array declaration syntax, using length member, Constructing Strings, Operating on Strings, Array of Strings, Using a string to control switch statement, Command line arguments, Conditional operator. Controlling access to class members, passing objects to methods, Returning Objects, Method Overloading, Overloading Constructor, Recursion, static keyword, Nested and inner classes, vararags

## **UNIT-III**

**Inheritance:** Basics, Member access, Constructor and Inheritance, using super keyword, multi-level hierarchy, method overriding, abstract classes, creating and implementing an interface, multiple interfaces. **Package:** Packages and member access, Importing packages, static import

### **UNIT-IV**

**Exception:** Exception Hierarchy, Multiple catch clauses, catching sub class exception, nested try blocks, throwing an exception, finally, throws, Java's Built in Exceptions. Introduction to I/O, Byte stream and Character stream, Reading and writing files using byte stream, Multithreading: Fundamentals, Life Cycle, Thread class, Runnable Interface, Multiple Threads, Thread priorities, Synchronization.

IcfaiTech - CURRICULARIAS IN THE Hyderanad DERABAD Esc (Physics) and B. Tech. (DS&AI)

ON FOR HIG

THE ICEAL FOUNDAILS ALFOR

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemedto-be-University Under Section 3 of the UGC ACT, 1992)

### **UNIT-V**

Database Connectivity: Overview of RDBMS, Call Level Interface (CLI), JDBC, JDBC Architecture, types of JDBC Drivers, JDBC Connection using Statement, Prepared Statemen and Callable Statement, Scrollable and Updatable Result Set, Inserting & Fetching from BLOB Columns, Managing Transactions in JDBC. Exploring My Cloud Powered by AWS: Virtualization, Types of Virtualization, Cloud Containers, Client server computing, Big Data, Data Analytics, Data Visualization, DBMS, Relational and Non-Relational DBMS, Data Warehouse Basics, HTML basics to design a Web Page, QoS Factors, File System, Load Balancing, and Domain Name System.

### **Text Books:**

1. Java Fundamentals A Comprehensive Introduction, Herbert Schildt, Dale Skrien. Tata McGraw Hill, 1<sup>st</sup> Edition, 2013.

## **Reference Books:**

- 2. Java The Complete Reference, Herbert Schildt, 7th Ed. TataMcGrawHill (2007)
- **3.** Programming with Java A Primer, E. Balaguruswamy,3rd Ed,TataMcGrawHill 2007
- **4.** Object Oriented Programming with Java: Essentials and Applications, Rajkumar Buyya, Thamarai Selvi Somasundaram, Xingchen Chu, 1st Ed. TataMcGrawHill 2010
- 5. Java How to Program, Paul Dietel and Hervey Dietel, 9th Edition

## **Course Outcomes**

After successful completion of the course student will be able to

- 1. Understand object-oriented programming concepts and basics of java programming
- 2. Solve real world problems using OOP techniques
- 3. Understand the use of abstract classes, packages and interfaces.
- 4. Expand their knowledge of AWS cloud computing models, services and tools through narrative-based scenarios and short interactive tasks.

IcfaiTech - CURRICULUM&SY, IABUS, IFHE, Hyderabad BSc (Physics) and B.Tech.(DS&AI)

OR HIG

REGIST & AR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UCC ACT, 195)

Course No:	Course Title: Electrical Sciences I	L	P	U
IPDES211	Course Title. Electrical Sciences I	3	0	3

• To equip the students with a basic understanding of Electrical circuits and machines for specific types of applications.

### **Course Contents**

### **UNIT-I**

DC Circuits, Kirchhoff's Laws, Mesh & Nodal analysis, D.C transients- First order & second order circuits- The natural and complete Response

#### **UNIT-II**

Thevenins & Nortons theorem, Linearity, Superposition, Maximum power transfer theorems, Star- Delta transformation and Concept of Duality

## **UNIT-III**

AC Circuits: Current, voltage, power, - circuit elements R, L and C, phasor diagram, impedance, real and reactive power in single phase circuits, Steady state analysis of AC circuits using Phasor Method, Resonance in series and parallel circuits

## **UNIT-IV**

Transformers- Introduction, Ideal transformer with and without core losses, Transformer circuit model, Determination of parameters and voltage regulation & efficiency.

## **UNIT-V**

Induction motor, circuit model & Rotating magnetic field, Torque-Slip characteristics, Synchronous machines and and applications.

IcfaiTech - CURRICULUM AND THE HYDERABAD THE ICFAI FOUNDATION FOR HIGHER EDUCATION NO. (Deemed to be University Under Section 3 of the UGC ACT, 195)

B.Sc (Physics) and B.Tech.(DS&AI)

## **Text Books:**

1. Hughes revised by Mckenzie Smith with John Hilcy and Keith Brown, 'Electrical and Electronics Technology', 8th Edition, Pearson, 2012

## **Reference Books:**

- 1. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, 2009, Third edition
- **2.** Leonard Bobrow, *Fundamentals of Electrical Engineering*, Oxford University Press 2nd edition 2005
- **3.** W.H.Hayt, J.E. Kemmerly, *Engineering circuit analysis*, McGraw Hill Company, 6<sup>th</sup> Edition, 2000.

## **Course Outcomes**

• The students shall develop an intuitive understanding of the circuit analysis, basic concepts of electrical machines and be able to apply them in practical situation.

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

PI THE SHIP OF WESTERN STORY

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 195)

Course Not		L	P	U
IPDES212	Course Title: Digital Electronics	2	2	3

- To obtain the knowledge of basic tools for the design of digital circuits.
- To understand the methods, procedures suitable for a variety of digital computers and related applications.

### **Course Content**

#### **UNIT-I**

Review of number systems-representation-conversions, Boolean algebra- theorems, sum of product and product of sum simplification, canonical forms-minterm and maxterm.

## **UNIT-II**

Simplification of Boolean expressions-Karnaugh map, completely and incompletely specified functions, Quine Mc Cluskey method, Implementation of Boolean expressions using universal gates.

### **UNIT-III**

Combinational logic circuits- adders, subtractors, BCD adder, ripple carry look ahead adders, parity generator, decoders, encoders, multiplexers, demultiplexers, Realization of Boolean expressions- using decoders-using multiplexers. Memories – ROM- organization, expansion. PROMs. Types of RAMs – Basic structure, organization, Static and dynamic RAMs, PLDs, PLAs, PALs, Dual Data RAM (DDR), FPGA

### **UNIT-IV**

Sequential circuits – latches, flip flops, edge triggering, asynchronous inputs. Shift registers, Universal shift register, applications. Binary counters – Synchronous and asynchronous up/down counters, mod-N counter, Counters for random sequence.

## **UNIT-V**

Synchronous circuit analysis and design: structure and operation, analysis-transition equations, state tables and state diagrams, Modelling- Moore machine and Mealy machines, Serial binary adder, sequence detector, state table reduction, state assignment. Hazard; Overview and comparison of logic families.

THE ICFAI FOUNDATION FOR HIGHER EDUCATION A NOT COME UNIT OF THE USE OF THE U

B.Sc (Physics) and B.Tech.(DS&AI)

## **Text Books**

1. M Morris Mano, Digital Design, 5th edition, Pearson Education, New Delhi, 2013.

## Reference Books

- 1. Charles H. Roth, Jr, Fundamentals of Logic Design, 5<sup>th</sup> Edition, CENGAGE Learning, India, 2004.
- 2. ZVI Kohavi and Niraj K Jha, Switching and Finite Automata Theory, 3<sup>rd</sup> Edition, Cambridge University Press, New Delhi, 2011.

# **Course Outcomes**

# Upon successful completion of the course, student will be able to:

- Realize complex logic functions utilizing programmable logic.
- Apply the digital design principles in real time applications.

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

Course No:	Course Titles Engineering Machanics	L	P	U
IPDES213	Course Title: Engineerng Mechanics	3	0	3

- To introduce the basic principles of engineering mechanics.
- To introduce concepts of equilibrium of bodies at rest and in dynamics, the motion of bodies and the forces that cause them.
- To emphasize analysis and application to practical engineering problems.
- To promote thinking and problem solving capacity of students.

## **Course Content**

## **UNIT I**

Concurrent forces on a plane – composition, Resolution and equilibrium of concurrent coplanar forces, Methods of moment, Friction, Parallel forces in a plane – General case of parallel forces,

## **UNIT II**

Center of parallel forces and center of gravity- centroids of composite plane figure and curves, Moments of inertia - Plane figure with respect to an axis in its plane and perpendicular to the plane – parallel axis theorem

## **UNIT III**

General case of forces in a plane – composition and, equilibrium of forces in a plane –plane trusses – method of joints and method of sections, Principle of virtual work equilibrium of ideal systems

## **UNIT IV**

Rectilinear Translation – Kinematics – Principles of Dynamics - D' Alembert's Principle-Momentum and impulse- work and energy- impact

## **UNIT V**

Curvilinear translation – Kinematics – equation of motion – projectile – D' Alembert's Principle for curvilinear motion – Kinetics of Rotation of rigid body

HYDERABAD

IcfaiTech - CURRICULUM&SYLLABUS IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 1956)

### **Text Books**

1. S Timoshenko & D.H Young, "Engineering Mechanics" McGraw Hill, 4th Edition

## Reference Books

- 1. Fundamental of Engineering Mechanics: S. Rajesekharan& G. SankaraSubramanium; Vikas Publishing House Pvt. Ltd., (2<sup>nd</sup> Edition)
- 2. Engineering Mechanics: K.L Kumar; Tata McGraw Hill, 4th Edition
- 3. A K Tayal, Engineering Mechanics, Umesh Publication, Delhi, 14<sup>th</sup> Edition.

## **Course Outcomes**

Upon successful completion of this subject students should be able to:

- Apply the concepts of equilibrium to system of forces on rigid bodies.
- Simplify and clarify mechanics problems using free body diagrams.
- Analyze equilibrium of rigid bodies with frictional forces.
- Determine force couples, centre of gravity and moment of inertia of rigid bodies.
- Determine simple dynamic variables and solve simple dynamic problems involving kinematics, energy and momentum.
- Analyze simple statically determinate structures such as beams, pin jointed trusses and pin jointed frames subjected to various loading and supporting conditions.

IcfaiTech - CURRICULU (SVYLABUS, IFHE,-Hyderabar) BSC (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University United Section 3 of the UGC ACT, 1957)

Course No:	Course Title: Dringiples of Feenemies	L	P	U
IPDECON214	Course Title: Principles of Economics	3	0	3

The course aims to provide to the students an insight into the scientific & analytical methods, techniques and tools of economics, a precise and comprehensive coverage of fundamental concepts in economics; and give suitable examples to expose him/her to possibilities of applications of these concepts in business and economic policy.

### **Course Content**

- Introduction to Economics
- Application of Supply & Demand & Elasticity
- Demand and Consumer Behaviour
- Production & Business Organization
- Analysis of Costs
- Input Pricing by marginal productivity
- Perfectly Competitive Markets
- Imperfect Competition and its polar case of monopoly
- Oligopoly and Monopolistic Competition
- Externalities, Public Goods & Imperfect Information
- Macroeconomic concerns and its components
- GDP, Growth, Unemployment & Inflation
- Multiplier, Fiscal Policy at work
- Monetary Policy at Work and Money Supply.
- Open Economy

## **Text Books**

1. Principles of Economics, Case E. Karl & Fair C., Pearson Education, 6th Edition, 2002.

## Reference Books

- 1. Economics, Samuelson & Nordhus, TMH, 16th Edition, 1998.
- 2. Principles of Economics, Lipsey, RG & K.A. Chrystal, Oxford University Press, 9th Edition, 1999

lcfaiTech - CURRICULUM&SYL BUS, IFHE, Hyderahad D.Sc (Physics) and B.Tech.(DS&AI)

HYDERABAD

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 1953)

Course No:	Community Variables	L	P	U
IPDMATHC215	Course Title: Complex Variables	3	0	3

- Identify and construct complex-differentiable functions.
- Use the general Cauchy integral theorem and formula.
- Use conformal mapping.
- Express functions as infinite series or products.

## **Course Content:**

**UNIT I:** Regions in the Complex plane, Functions of Complex Variable, limits. Mappings, Theorems on limits, Continuity.

**UNIT II:** Derivatives, Analytic Functions, Cauchy-Riemann equations, harmonic functions, Exponential, logarithmic functions, complex exponents, Complex Trigonometric, Hyperbolic functions and their inverses.

UNIT III: Contour integrals, Anti derivatives, Cauchy theorem, Cauchy Integral Formula,

UNIT IV: Morera's theorem, Liouville's Theorem, Maximum Modulus Principle, Convergence of sequences of series, Taylor's and Laurent series,

**UNIT V:** Residues poles and zeros of analytic functions, Applications of residues, Conformal mapping, Fourier Transforms and Z Transforms.

#### Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Latest Indian Edition

## **Reference Books:**

- 1. Complex Variables and Applications, J.W. Brown, R.V. Churchill, Mc Graw-Hill, 7th ed, 2003.
- 2. Complex analysis for Mathematics & Engineering, , John H Mathews & Russel W Howell, Jones & Barlett Publishers, 2001
- 3. NPTEL Videos <a href="http://nptel.ac.in/courses/111103070/">http://nptel.ac.in/courses/111103070/</a>

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad . Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University United Section 3 of the UGC ACT, 1956)

THE SUPPLIES TO VIEW TO SEE HIGHER ELECTION TO SEE THE SECURITION OF SEC

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Define continuity and differentiability for complex functions,
- Prove the Cauchy-Riemann equations and apply them to complex functions in order to determine whether a given continuous function is complex differentiable,
- Compute the radius of convergence for complex power series,
- Define the complex exponential function, trigonometric and hyperbolic functions and use their basic properties,
- Evaluate integrals along a path directly from the definition and also via the Fundamental Theorem of Contour Integration and Cauchy's Theorem,
- Compute the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues,
- Prove the Cauchy Residue Theorem and use it to evaluate integrals.

M&SYLABUS, IFHE Hyderabad REGISTRAR

Course No:	Course Title: Differential Equations and Fourier	L	P	U
IPDMATH216	Series	3	0	3

- To solve first and second order Ordinary Differential Equations by standard methods
- To gain exposure to Engineering applications of Ordinary Differential Equations.
- Introduction to Laplace Transforms for future Engineering courses
- Basics of Fourier series required for Engineering
- Solving important Partial Differential Equations (Simple cases of Wave & Heat equations).

## **Course Contents**

**UNIT-I** First order differential equations, Reduction of order, second order equations with applications bending of beams and electrical circuits.

**UNIT-II** Second order homogeneous equations with constant coefficients and the Method of Undetermined Coefficients, Variation of parameters, higher order linear equations.

**UNIT-III** Power series solutions and ordinary points, Frobenius Method & Regular singular points, Gauss' hyper-geometric equation, Legendre polynomials & Bessel functions.

**UNIT-IV** Laplace Transform & Inverse Laplace Transform, Convolution of Laplace Transform & application to differential equations,

UNIT- V Fourier series and convergence, Cosine and Sine series, Sturm-Liouville problem, one dimensional Heat and Wave equations and Laplace equations in rectangular form.

cfaiTech - CURRICULUN & SYLLABUS, IFHE, Hyderaland

FOR HIGHER EDUCATION

Advanced Engineering Mathematics, Erwin Kreyszig 10<sup>th</sup> Edition, John Wiley & Sons, 2012.

## **Reference Books:**

- 1 George F.Simmons and Steven. G. Krantz, Differential Equations: Theory, Technique and Practice Tata Mc-Graw Hill, 2007.
- 2 Elementary Differential Equations, W.E.Boyce and R.C.Diprima, 7<sup>th</sup> Edition, John Wiley, 2001.

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Solve standard ODEs of First and Second Order
- Compute Laplace and Inverse Laplace Transforms for functions in Engineering
- Expand functions in Fourier/Sine/Cosine series
- Obtain series solutions for standard PDEs in two variables

IcfaiTech – CURRICULIMS VILLARUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1057

Course No:	Course Title: Electrical Science II	L	P	U
IPDES221	Course Title. Electrical Science II	3	0	3

- Characterize semiconductors, diodes, transistors and FETs
- To study behavior of Diod and its applications
- To study characteristics of electronic devices to understand their behavior.
- To design simple analog circuits using BJTs, FETs and Diodes.
- To design and evaluate audio, Power and Feedbak amplifiers.

## **Course Contents**

#### **UNIT-I**

Semiconductors: intrinsic and doped; p-n junction. Junction Diode & its characteristics. Defferent types of modeling of Diodes. Ideal Diode and Practical diodes. Zener Diode & its characteristics. Applications of Zener Diode. Application of Practical Diodes: Clamper and Peak to Peak Detector.

#### **UNIT-II**

Introduction to transistors, PNP Transistor, NPN transistors and their characteristics & operation.

Types of biasing the transistors.CE & CB Configuration. Different catergories of operation: active region, Cutoff and Saturation. Application to Digital Logic Circuits. Introduction to JFETs, their operation & characteristics. MOSFETs & its characteristic (Depletion and Enhancement MOSFET). Introduction MOSFET logic gates and characteristics. Introduction CMOS logic gates and characteristics.

## **UNIT-III**

Introduction to JFETs, their operation & characteristics. MOSFETs & its characteristic (Depletion and Enhancement MOSFET). Introduction MOSFET logic gates and characteristics. Introduction CMOS logic gates and characteristics.

## **UNIT-IV**

Biasing the BJT and Amplifier, Small Signal AC Models, Additional Amplifier Principles. FET Amplifier with common source, fixed biasing and self-bias. Biasing Enhancement MOSFETs. Small Signal AC Models, MOSFET feedback amplifiers. Effect of bypass capacitors, FET amplifiers. Class A Power Amplifier, Power terminology, Class B power amplifier maximum output power.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION

B.Sc (Bysics) and B.Tech.(DS&AI)

1 380 on to 2 --- 3 of the US

## **UNIT-V**

Ideal Op-amp characteristic, equivalent circuit & Block diagram, Parameters of practical Op-amp, CMRR, skew rate, offset voltage and current Series parallel FB amplifier, non-ideal op-amp.

## **Text Books:**

1. Leonard Bobrow, *Fundamentals of Electrical Engineering*, Oxford University Press, Asian Edition Adapted by Navneet Gupta.

## **Reference Books:**

- **1.** Alan R. Hambley, *Electrical Engineering: Principles and Applications*, Publisher, 6nd Edition 2013.
- **2.** W.H.Hayt, J.E. Kemmerly, *Engineering circuit analysis*, McGraw Hill Company, 8th Edition, 2013.
- 3. Vincent Del Toro, Electrical Engineering Fundamentals, Phi Learning, 2<sup>nd</sup> Edition.

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Study and analyze the behavior of PN junction diodes.
- Characterize the current flow of a bipolar transistor in CB and CE configurations
- Bias the transistors and FETs for amplifier applications.
- Realize simple amplifier circuits using BJT and FET.

b.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Doesned to be University Under Section 3 of the UGC ACT, 1956)

(1956) AND AND ASSESSED FOR

HYDERABAD

HE IOFA! FOUNDATION FOR HIGHER STRUCK

CONTRACT OF THE CONTRACT OF THE PROPERTY OF THE PROPERT

Course No:	Course Title: Professional Communication	L	P	U
IPDTA223	Course Title: Professional Communication	3	0	- 3

The course aims at acquiring the students

- to understand various aspects of business communication.
- to gain knowledge regarding the various ways of assembling information,
- to write clearly and concisely and to present information in an effective manner
- to train them for oral presentation.

#### **Course Contents**

#### UNIT-I

Basics of Communication process, Features of Techincal communication, differences between general purpose communication and technical communication, Verbal and non verbal communication and their differences, understanding and overcoming barriers of communication.

## **UNIT-II**

Definition and characteristic features of a technical report, Classification of reports, Strucutre and Layout of report, Various elements of a report and features of each of the elements, Various ways of collection of data, principles of preparing a questionnaires, Practicing questionnaire preparation, Organization of materials, Preparation of the outline, Formatting techniques.

#### **UNIT-III**

Elements of effective writing, Mechanics of writing, Writing styles and use of suitable words and phrases for technical writing according to the context, Revision practices, Principle steps of writing a précis, making notes, abstract and executive summary.

## **UNIT-IV**

Oral presentation features, Use of illustrations, tables and visual aids in presentation and technical writing, Non –verbal aspects in oral presentations, Reading skills for different purposes.

# **UNIT-V**

Distinctive features of memo reports and letter reports, Preparing Notice, Minutes of meeting Brochures, Instructions manual and User's Manual, Understand the difference between Preparing Notice, Minutes of meeting Brochures, Instructions manual and User's Manual, Business Letter formats, layouts and its significance.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

REGISTRAR
FAI FOUNDATION FOR HIGHER EDUCATION

1. Koneru. A. (2008). Professional Communication. McGraw Hill

## Reference Books:

- 1. Omfort, Jeremy et al (1984). Business Report in English. Cambridge University Press
- 2. Gerson & Gerson (2000). Technical Writing Process and Product. Pearson Education.

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Understand the aspects of verbal and non verbal communication in its significane in professional and personal communication
- Utilize their knowledge of report writing and write appropriate technical reports.
- Make oral presentations
- Distinguish between various busniness communicational formats and use them appropriately.

IcfaiTech - CURRICULUM&SVILABUS, IFHE, Hyderabad REDISTRAR

THE ICFA! FOUNDATION FOR HIGHER EDUCATION

(Decreed-to-be-University Under Section 3 of the UGC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

RE KIEN FOUND OF

FOR H

HYDERABAD

Course No:		L	P	U
IPDMGTS224	Course Title: Principles of Management	3	0	3

The course aims at acquainting the students with various aspects of modern management. During the past two decades a revolution has taken place in the area of management. The new era is one in which entrepreneurship; innovation & technology are seen as the backbone of management. The emphasis is on the modern management essentials, drawing up from the earlier principles & practices, so as to enable the students to be familiar with the basic concepts of management when they enter the professional world.

## **Course Content**

- Introduction to Management: Science, Theory & Practice
- Management & Society: Social Responsibility and Ethics
- Essentials of Planning
- Setting Objectives
- Strategies, Policies & Planning Premises
- Decision- Making
- The Nature of Organizing
- Organizational Structure: Departmentation
- Line/ Staff Authority, Empowerment, & Decentralization
- Managing Change through Manager and Organization Development
- Human Resources Management and selection
- Performance Appraisal & Career Strategy
- Motivation
- Leadership
- Communication
- The System & Process of Controlling
- Control Techniques
- Marketing Management
- Production & Operations Management
- Information Technology
- International Management

#### Text Books

1. "Essentials of Management", Koontz H. and Weihrich H., 7th edition, Mcgraw Hill Int. ed., 2007.

## Reference Books

1. "Management, Principles and Practices for Tomorrow's Leaders", Gary Dessler, 3rd edition, Prentice Hall, 1998.

2. Engineering Management, Fraidoon Mazdaokstoglition, Addison-Wesley, 1999

IcfaiTech - CURRICULUM & LLABUS, IFHE, Hyderabadol B.Sc (Physics) and B.Tech.(DS&AI)

Deemed to be University Unity Section 3 of FT. 1956)

Course No:	Carras Title: Ontinization Techniques	L	P	U
IPDAO225	Course Title: Optimization Techniques	3	0	3

- Introduction to optimization techniques using both linear and non-linear programming.
- Students will learn to frame minima maxima problems in the framework of optimization problems.

#### **Course Content:**

## **UNIT-I:**

Introduction to Linear Programming, Assumptions of Linear Programming, the Simplex Method in Tabular Form, the Revised Simplex Method, Duality Theory, Primal-Dual Relationships

## UNIT-II:

The Transportation Problem, Methods of solutions to transportation problem, The Assignment Problem, Hungarian Metod

## **UNIT-III:**

Dynamic Programming, Characteristics of Dynamic Programming Problems, Deterministic Dynamic Programming

#### **UNIT-IV**

Integer Programming, Formulation, the Branch-and-Bound Technique, a Branch-and-Bound Algorithm for Mixed Integer Programming

#### **UNIT-V:**

Nonlinear Programming , Graphical Illustration of Nonlinear Programming Problems , Types of Nonlinear Programming Problems , One-Variable Unconstrained Optimization , Multivariable Unconstrained Optimization , The Karush-Kuhn-Tucker (KKT) Conditions for Constrained Optimization.

#### **Text Books:**

1. F.S.Hillier, G.J. Lieberman, Introduction to Operations Research, 9e, TMH, 2012

## Reference Books:

- 1. H.A. Taha, Operations Research- An Introduction, 7e, PHI,
- 2. Ravindran, Phillips, Solberg, Operations Research: Principles and Practice, 2e John Wiley & Sons, 2007

## **Course Outcomes:**

By the end of the course, students should be able to:

• Cast minima/maxima problems into optimization framework.

• Learn efficient computational procedures to 50 ve optimization problems.

HYDERABAD

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Uniter Section 3 of the UGC ACT, 1956)

Course No: IPD	Course Title: Structure and Properties of Materials	L	P	U
ES226	Course Title. Structure and Properties of Materials	3	0	3

- The course is interdisciplinary in nature, predominantly covering the fields of physics, chemistry, mechanical and metallurgical engineering
- The course is offered to students of all branches of engineering, and provides an excellent understanding of the structure of materials at the atomic and microscopic level
- The main objective is to show how the type of bonding and crystal structure affects properties of metallic, ceramic, electronic and polymeric materials
- The course aims at to establish correlation between processing/Structure/Performance of materials of importance and shed light on interesting materials and their applications

# **Course Contents**

## **UNIT-I**

General understanding of materials science, Bonding forces and their types: Atomic bonding in solids. Crystal structures and systems: Unit cells, crystallographic directions and planes, Crystalline and non crystalline materials, Single crystals and polycrystalline Materials, Metallic structures, Ceramic and polymer crystal structure, Density computations, Linear and planar densities, Polymorphism and allotropy, Imperfections in solids: Impurities in solids, specification of composition, Defects and dislocations, point defects, Linear defects, Interfacial and bulk defects.

## **UNIT-II**

Diffusion in solids: Diffusion mechanisms, steady and non-steady state diffusions, Factors that affect diffusion, Diffusion in Ionic and polymeric materials. Dislocations and strengthening mechanism in metals: Dislocation characteristics, Slip systems, slip in single crystals, plastic deformation of polycrystalline solids, strengthening mechanisms and strain hardening. Mechanical Properties of solids: Concepts of stress and strain, Elastic and Plastic deformation, Hardness

#### **UNIT-III**

Structure and properties of ceramics: Mechanical test behavior of ceramics, Types and application of ceramics, Applications and processing of ceramics, Fabrication and processing of glasses: Glasses - Glass forming – properties, heat treatment of glasses and glass ceramics. Polymer structures: Molecular size, shape & structure of polymers, Important Characteristics of polymeric materials, Mechanical behavior, Crystallization and processing of polymers

IcfaiTech - CURRICULUM& LLABUS, IFHE, Hyderabad

ICFAI FOUNDATION

REGISTRAR
DATION FOR HIGHER EDUCATION
rity Under Section 3 of the UGC ACT, 1955

## **UNIT-IV**

Phases, microstructures, phase equilibrium: Phase diagrams, unary, binary and binary Eutectic phase diagrams, Lever Rule. Iron carbon systems: Fe-Fe<sub>3</sub>C phase diagram, development of micro-structure in Fe-C alloys. Kinetics of phase transformations: Avarami rate equation, Correlation of properties to microstructures, Isothermal transformation diagrams - continuous cooling diagrams, Mechanical behavior of Fe-C alloys, tempered martensite

#### **UNIT-V**

Thermal properties of materials; Electronic properties: Energy band in semiconductors etc., Piezoelectricity and Ferro electric materials, applications. Magnetic properties: Super conductivity, superconducting materials and applications, Nanotechnology: Carbon Nano Tubes and their applications.

## **Text Books:**

1. Callister's Materials Science & Engineering Adopted by R. Balasubramaniam, Wiley India Pvt. Ltd., 9<sup>th</sup> Edition, Reprint 2016.

## **Reference Books:**

- 1. Engineering Materials: Properties and Selection, K.G. Budinski and M. K. Budinski, Prentice Hall of India, 9<sup>th</sup> Edition, 2008.
- 2. The Science and Engineering of Materials, Donald R. Askeland and Pradeep P. Phule, 4th Edition, Thomson book Company, 2003.
- 3. Principles of Materials Science and Engineering, William F. Smith, Mc Graw-Hill 3<sup>rd</sup> Edition 1996.

#### **Course Outcomes**

## Upon successful completion of the course, student will be able to:

- Identify bonding in different material types; describe the lattice structure of materials; describe the lattice parameters for 7 crystal systems; specify the Miller indices for the planes in a unit cell of metals, ceramics and polymers. Define isotropy and anisotropy w.r.t. material properties; describe various types of defects and dislocations and interpret atomic structure within the vicinity of grain and twin boundaries.
- Describe the atomic mechanisms of diffusion in metallic, ionic and polymeric materials; distinguish between steady state and non-steady state diffusions; Explain the factors that affect the rate of diffusion; define slip systems and its relation to mechanical properties; Define stress, strain, state Hook's law, Poisson's ratio; Discuss various mechanical properties like strength, toughness, resilience and hardness

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad

THE ICFAI FOUND THON FOR HIGHER EDUCATION

(Deemed-to-be-University Under Section 3 of the USC ACT, 1956)

- Describe the process used to produce glass-ceramics; describe structure, composition of different types of ionic, covalent ceramics viz. cements, refractories, clay products, abrasives. Compute the flexural strength of ceramics by transverse bending test; Interpret the effect of porosity on strength of ceramics; explain the procedure of thermal tampering of glass; Describe polymer structure, classification based on shape, size, chemistry and molecular configuration; Thermosetting and thermoplastic polymers; Interpret mechanical properties of elastomers
- Describe phase, composition in binary phase diagram of alloys; explain the phase diagram of Fe-C systems and estimate the composition of individual phases Explain the kinetics of phase transformation; describe the microstructure of micro-constituents of iron alloy and cite mechanical characteristics of each; Isothermal cooling and C-C-T diagrams.
- Describe the electronic band structure; electrical conductivity of metals, semiconductors, electronic mobility; Describe the phenomenon of ferroelectricity and piezoelectricity; Describe the phenomenon of superconductivity; Define heat capacity and specific heat, thermal conductivity and thermal stress; Determine the linear coefficient of thermal expansion; explain the phenomenon of thermal expansion from an atomic perspective; Explain the structure, property and applications of nano materials.

1201 DA 109 82 10 E =

IcfaiTech - CURRICULUMS STLLABUS, IFHE, Hyderaba THE ICFAI FOUNDATION FOR HIGHER EDUCATION

Physics) and B.Tech.(DS&AI)

Course No:	Course Title: Control System	L	P	U
IPDAO312	Course Title. Control System	3	0	3

• To equip the students with the fundamental concepts in control systems.

## **Course Content**

#### **UNIT-I**

Modelling of physical systems: Differential equations of physical systems, mechanical systems and electrical analogies, Electrical systems - Electromechanical systems - Mechanical systems - Thermal systems. Concept of Transfer Function, Block diagrams and reduction methods, Construction of Signal flow graphs; Mason's Gain formula and its applications

#### **UNIT-II**

Feedback systems and effect of feedback on sensitivity and system dynamics, Effect of feedback on control systems with disturbance signals. Time domain analysis: Test signals and time domain response of first order system, Response of second order system; time domain specifications, Steady state errors and error constants for various types of systems

## **UNIT-III**

Stability of control systems and effect of root locations, Routh-Hurwitz stability criterion. Concept of root locus and magnitude and angle criteria, Root locus construction rules, Effect of pole-zero additions on the root loci.

## **UNIT-IV**

Frequency domain analysis: Bode plot - Polar plot - Nyquist plot - phase-margin - gain margin - Nyquist stability criterion.

#### **UNIT-V**

Controller design: Design of P, PI, PID, lag, lead, lead-lag compensator design.

IcfaiTech - CURRICULUM&SYILABUS, IFHE, Hyderabad



- 1. Katsuhiko Ogata, '*Modern Control Engineering*', 5th Edition, Pearson Education Publishers, New Delhi, 2010.
- 2. Nagrath I.J. and Gopal M, 'Control Systems Engineering', 5<sup>th</sup> Edition, New Age International Publications, New Delhi, 2010.
- 3. Benjamin C.Kuo and Farid Golnaraghi, 'Automatic Control Systems', 8th Edition John Wiley & Sons Publications, New Delhi, 2002.

## Reference Books

- 1. Richard C. Dorf and Robert H. Bishop. 'Modern Control Systems', 12<sup>th</sup> Edition Pearson Prentice Hall Publications, New Delhi, 2010.
- 2. Gene F. Franklin, J. David Powell and Abbas Emami-Naeini, 'Feedback Control of Dynamic Systems', 6<sup>th</sup> Edition. Pearson Education India Publications, New Delhi, 2008.

#### **Course Outcomes**

# Upon successful completion of the course, student will be able to:

- Understand the concepts of closed loop control systems.
- Analyze the stability of closed loop systems.
- Apply the control techniques to any electrical systems.
- Design the classical controllers such as P, PI, etc., for electrical systems.

IcfaiTech - CURRICULUM&SYLLANDS, IFHE, Hyderahad

THE ICFAI FOUNDA

IGN FOR HIGHER EDUCATION
Whiler Section 3 of the UGC 2

ace I TA let an to E

# B.Sc. Program (Physics) Course Handouts

Course No:	Course Title: Physics-I	L	P	U
IPDPHY114	Course Title: Physics-I	3	0	3

# **Course Learning Objectives:**

Develop an understanding of the basic principles of Mechanics and wave optics and the application of the principles with emphasis on problem solving skills.

#### **Course Content:**

## **UNIT I**

Conservation of Momentum: Collisions, Impulse-Momentum Theorem, Conservation of Momentum, Two-body collisions, Complex Motions, Many-particle systems, Center of Mass and Conservation of momentum

#### UNIT II

Rotational motion: Rotational Kinematics, Relation between linear and angular variables, Torque and Rotational inertia, Rolling without slipping, Angular momentum for system of particles, Conservation of angular momentum

# **UNIT III**

Conservation of Energy: Work, Energy and Power, Work-Energy theorem, Conservative forces, Potential energy, Conservation of mech. Energy, Work done by ext. force, Frictional force, Conservation of total energy

## **UNIT IV**

Oscillators and Waves: Simple Harmonic Oscillator, Free, Damped and Forced Oscillations, Types of waves, Traveling waves, Interference of waves, Standing waves etc

## **UNIT V**

Optics: Double-Slit interference, Interference due to thin films, Single Slit diffraction, Intensity calculation, Multiple slits, Diffraction gratings, Dispersion and Resolving power

lcfaiTech - CURRICULUM&SYLLADUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-Univers'ty Under Section 3 of the USC ACT 1954)

HYDERABAD Playsics) and B.Tech.(DS&Al)

1. Robert Resnick, David Halliday and Kenneth S. Krane "Physics", Vol. I and II, 5th Edition John Wiley Inc, Singapore, 2002.

## **Reference Books:**

- 1. Robert Resnick, David Halliday and Jearl Walker "Fundamentals of Physics", 6th Edition, John Wiley Inc, Singapore, 2001.
- 2. Cutnell and Johnson, "Physics", 5th Edition, John Wiley, Asia, 2001.

## **Course Outcomes**

- Apply conservation of linear momentum to two/many body systems in lab and centre of mass frame of reference.
- Apply conservation of angular momentum to two/many body systems in lab and centre of mass frame of reference.
- Apply the conservation of energy principle and find the work done by a body under the influence of conservative/non-conservative forces.
- Understand the types of oscillations/waves and the fundamental equations governing them.
- Understand the physics of the most important phenomena in wave optics, namely, interference, diffraction.

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION

The mention be University Under Section 3 of the USC ACT, 195

NOTACUES ESPECIAL

Course No:	Course Title: Physics-II	L	P	U
IPDPHY124	Course Title. Filysics-II	3	0	3

Develop an understanding of the basic principles of electromagnetism and the application of the principles with emphasis on problem solving skills.

## **Course Content:**

#### **UNIT I**

Coulomb's law, continuous charge distributions. Electric field of point charges, continuous charge distributions, field lines, point charge and dipole in an electric field. Flux of a vector field, flux of electric field, Gauss' law, its applications, Gauss' law and conductors.

#### **UNIT II**

Electric potential, potential due to point charges and continuous charge distribution, calculating field from potential, potential from field, equipotential surfaces, potential of a charged conductor. Types of materials, conductor in an electric field, Ohm's law, Ohmic materials. Capacitance, calculation of capacitance, capacitors in series and parallel, energy storage in an electric field, capacitor with dielectric

## UNIT III

Magnetic interactions, magnetic poles, force on a moving charge, circulating charges, force on a current carrying wire, Hall effect, torque on a current loop. Magnetic field due to moving charge, due to current, parallel currents, field of a solenoid, Ampere's law.

## **UNIT IV**

Faraday's law, Lenz' law, motional emf, induced electric fields. Magnetic dipole and force on a magnetic dipole in a non-uniform field, Magnetization, Gauss' law for magnetism. Inductance, calculating the inductance, energy storage in magnetic field

## **UNIT V**

Equations of electromagnetism, Maxwell's equations, induced magnetic fields and Displacement currents. Concept of photons, Thermal radiation, photoelectric effect. Matter waves, de Broglie's hypothesis, experimental verification by Davison and Germer experiment, uncertainty principle.

IcfaiTech - CURRICULUM&SYL ABUS, IFHE, Hyderabas HYDERABASCOPhysics) and B.Tech.(DS&AI)

THE ICFAI FOUN FOR HIGHER EDUCATION

N FOR HI

1. Physics, Robert Resnick, David Halliday and Kenneth S. Krane Vol. 2, John Wiley, 5th ed., 2002.

## Reference Books:

- 1. Fundamentals of Physics, Robert Resnick, David Halliday and Jearl Walker, John Wiley, 6th ed., 2001.
- 2. Physics, Cutnell and Johnson, John Wiley, 5th ed., 2001.
- 3. Introduction to Electrodynamics, David J Griffiths, PHI, 3<sup>rd</sup> ed., 2002.

# **Course Outcomes**

# Upon successful completion of the course student will be able to:

- Understand the main concepts of electromagnetic theory
- Develop the mathematical framework to explore electricity and magnetism
- Apply the mathematical framework quantitatively for solving relevant problems
- Appreciate qualitatively how they play a role in many aspects of daily life.

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the USC ACT, 1957

Course No:	Cayras Title: Ontics	L	P	U
PHY211	Course Title: <b>Optics</b>	3	0	3

- To understand the everyday optics phenomena.
- Fundamentals of optics and some of the principles of interference and diffraction phenomena using ray-nature of light and wave-nature of light are discussed.

#### **Course Content**

UNIT I

Refraction and reflection by spherical surfaces, Matrix method in Paraxial optics: Introduction, The Matrix method, Unit planes, Nodal planes and a system of two thin lenses, Location of cardinal points.

UNIT II [2]

Abberations: Chromatic aberrations, the acromatic doublet, removal of chromatic aberration, Spherical aberration: Lateral and longitudinal spherical aberration: Coma, Astigmatism, Minimization of these defects by proper methods.

UNIT III [12]

Wave theory of light: Superposition principle and coherence. Interference: Two beam interference by division of wavefront and amplitude. Young's double slit experiment, Lloyd's mirror and Fresnel biprism. Phase change on reflection, Interference in thin films: parallel and wedge shaped films. Fringes of equal inclination: Fringes of equal thickness: Newtons rings, Michelson interferometer.

UNIT IV [12]

Diffraction: Fresnel and Fraunhofer diffraction, Fraunhofer's diffraction due to single slit, double slit, multiple slits, diffraction grating and diffraction by a circular aperture (qualitative). Rayleigh's criterion-Resolving power of telescope, microscope and grating. Fresnel diffraction: Half-period zones, zone plate, Fresnel diffraction of a straight edge, a slit and a wire using half-period zone analysis.

UNIT V [9]

Polarization: Transverse nature of light, polarization by reflection, Fresnel's Formulae for perpendicular & parallel polarization cases, Reflection & Transmission coefficients, Brewster's law, Malus law, Double refraction, Nicol prism as an analyzer, Huygen's explanation of double refraction in uniaxial crystals, optics axis, Plane, circular and elliptical polarized light. Quarter wave plate, Half wave plate.

IcfaiTech - CURRICULUM&SXILABUS, IFHE Hyderabat B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOLDS ON FOR HIGHER EDUCATION

[Deemed to be light and section 3 of the USC ACT, 1956]

1. Optics, Ajoy Ghatak, Sixth edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 20016.

#### Reference Books

- 1. Fundamentals of Optics, F. A Jenkins and H.E White, Fourth Edition, Tata McGraw Hill Education Private Limited, New Delhi, 1976.
- **2.** Optics, Eugene Hecht, Fifth Edition, Addison Wesley Publishing Company Incorporated, 2016.
- 3. A text Book of Optics, N. Subrahmanyam, Brij Lal and M. N. Avadhanulu, S. Chand Limited, 2015.

#### **Course Outcomes**

Upon successful completion of the course student will be able to:

- Understand ray-based optical system analysis.
- Understand the properties of light caused by the wave nature such as interference, diffraction and polarization in terms of wave model and their applications.
- Students will develop independent problem solving skills.

# Skill development/Employability and Entrepreneurship:

Skill development

## List of experiments

- 1. Angle of the prism
- 2. Dispersive power of prism
- 3. Resolving power of grating
- 4. To determine the wavelength of light using diffraction grating

## Simulations:

1. Ray tracing simulators-online

IcfaiTech - CURRICULUM&S ABUS AFHE, Hyderabad

HE ICFAI FOUNDATION FOR HIGHER EDUCATION

eemed-to-be-University Under Section 3 of the UGC ACT, 1957 (ACREADUCE REPORTED TO BE 1) & 300 of th

Course No:	Course Title: Partial Differential Equations &	L	P	U
PHY221	Systems of ODEs	3	0	3

- Evaluate first order differential equations including separable, homogeneous, exact, and linear.
- Show existence and uniqueness of solutions.
- Solve second order and higher order linear differential equations.
- Create and analyze mathematical models using higher order differential equations to solve application problems such as harmonic oscillator and circuits.
- Solve differential equations using variation of parameters
- Solve linear systems of ordinary differential equations
- Introduce students to partial differential equations.
- Introduce students to how to solve linear Partial Differential with different methods.
- To derive heat and wave equations in 2D and 3D.

## **Course Contents**

#### **UNIT-I**

Systems of linear differential equations, types of linear systems, differential operators, an operator method for linear systems with constant coefficients.

## **UNIT-II**

Basic Theory of linear systems in normal form, homogeneous linear systems with constant coefficients (Two Equations in two unknown functions). Simultaneous linear first order equations in three variables, methods of solution.

## **UNIT-III**

Pfaffian differential equations, methods of solutions of Pfaffian differential equations in three variables.

## **UNIT-IV**

Formation of first order partial differential equations, Linear and non-linear partial differential equations of first order, special types of first-order equations, Solutions of partial differential equations of first order satisfying given conditions.

IcfaiTech - CURRICULUM&SYLLAROS, IFHE, Hyderabad

FOR HIGHER EDUCATION

## **UNIT-V**

Linear partial differential equations with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients, Partial differential equations with variable coefficients, Separation of variables, Non-linear equation of the second order.

#### **Text Books:**

1. J.Sinha Roy and S. Padhy, A Course on Ordinary and Partial Differential Equations, Kalyani Publishers, New Delhi, Ludhiana, 2012.

## Reference Books:

- 1. Differential Equations: Theory, Technique and Practice, George F.Simmons and Steven. G. Krantz, Tata Mc-Graw Hill, 2007.
- 2. An Elementary Course in Partial Differential Equations, T Amaranath, Narosa Publishing House, 2013.
- 3. S.L. Ross, Differential equations, 3rd Ed., John Wiley and Sons, India, 2004.
- 4. M.D. Raisinghania-Advanced Differential Equations, S. Chand & Company Ltd., New Delhi
- 5. An Introduction to Ordinary Differential Equations, Earl A. Coddington, PHI, 2002.

## **Course Outcomes**

# Upon successful completion of the course, students will be able to:

- The student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
- The student will be able to find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.
- The student will be introduced to the complete solution of a nonhomogeneous differential equation with constant coefficients by the method of undetermined coefficients.
- The student will have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients.
- Solve linear partial differential equations of both first and second order
- Apply partial derivative equation techniques to predict the behaviour of certain phenomena.
- Apply to specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialisation.
- Identify real phenomena as models of partial derivative equations.

IcfaiTech - CURRICULUMA SYLVABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UGC ACT, 1956)

Course No:	Course Title Colid State Dhysics	L	P	U
PHY311	Course Title: Solid State Physics	3	0	3

- To know and understand the basic theories of solid state structure
- To gain knowledge of the basic theories of electronic structure of materials
- To describe physical behavior of solids on the basis of solid state theory.

## **Course Content:**

## **UNIT I**

Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice with a Basis Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg'sLaw. Atomic and Geometrical Factor.

## **UNIT II**

Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T<sup>3</sup> law

## **UNIT III**

Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.

## **UNIT IV**

Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena.

## **UNIT V**

Elementary band theory: Kronig Penny model. Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient.

IcfaiTech - CURRICULUM&SYLLABOS, FHE Hyderabad

THE ICFAI FOUND ATTOM FOR HIGHER EDUCATION (Deemed to be divised at Under Section 3 of the UGC ACT, 1956)

1. H. Ibach and H Luth, Solid-state Physics, Springer, 2009

#### Reference Books:

- 1. Charles Kittel, Introduction to Solid State Physics, Wiley India Pvt. Ltd., , 8 ed. 2004
- 2. J.P. Srivastava, Elements of Solid State Physics, Prentice-Hall of India, 2 ed. 2006
- 3. Leonid V. Azaroff, Introduction to Solids, Tata Mc-Graw Hill, 2004
- 4. Neil W. Ashcroft and N. David Mermin, Solid State Physics, Cengage Learning, 1976
- 5. M. Ali Omar, Elementary Solid State Physics, Pearson India, 1999

#### **Course Outcomes:**

# Upon successful completion of the course, students should be able to:

- formulate the theory of X-ray diffraction in the reciprocal lattice (k-space) formalism and apply this knowledge to generalize the formulation for matter waves
- formulate the theory of lattice vibrations (phonons) and use that to determine thermal properties of solids
- formulate the problem of electrons in a periodic potential, examine its consequence on the band-structure of the solid and develop a framework that explains the physical properties of solids in terms of its band-structure
- identify the materials encountered in the course in a representative modern device/component, analyze why these are used and propose better alternatives if necessary
- Recognize that the developed k-space formalism to describe phonons, electrons, is more general and can be used to describe waves in a periodic media.

## **Skill Development:**

Aguiring measurement skills used in Solid State Physics.

Any five of the below may be introduced:

- 1. Measurement of susceptibility of paramagnetic solution (Quinck's Tube Method)
- 2. To measure the Magnetic susceptibility of Solids.
- 3. To study the PE Hysteresis loop of a Ferroelectric Crystal.
- 4. To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis.
- 5. To measure the resistivity of a semiconductor (Ge) with temperature (up to 150°C)
- 6. To measure the resistivity of a semiconductor (Ge) with temperature by two-probe method and to determine its band gap.
- 7. Analysis of X-Ray diffraction data in terms of unit cell parameters and estimation

SYLLABUS IFHE, Hyderabad IcfaiTech - CURRICULUMA Se (Physics) and B.Tech.(DS&AI)

REGISTRAR DATION FOR HIGHER EDUCATION THE ICFAI FOUNDATION FOR (Deemed to be University Under Section 3 of the UGC ACT, 1954) OTTAQUES REPORTED

Tim 3 of the UGC ACT 19521

of particle size.

8. Measurement of change in resistance of a semiconductor with magnetic field.

The skills that can be developed include associating the experiment to the relevant concept use of various equipments and tools understanding the principles and the working of the equipments used correct usage of the equipments data collection and organization graphical and numerical analysis of data interpretation of experimental results arriving at conclusions technical report writing.

In addition, the social and organizational skills developed are team work, coordination, time management, collaboration and communication.

IcfaiTech - CURRICULUM&SYLLABUS IFHE, Hyderabad
REGISTRAR

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

HYDERABAD B. B. Tech. (DS&AI)

	Course No:	Community Charles Electronic	L	P	U	1
ij,	PHY313	Course Title: Classical Electrodynamics	3	0	3	

- To develop a basic understanding of electric and magnetic fields in the differential form.
- To develop a working knowledge of the underlying principles of electrodynamics.

## **Course Contents:**

## **UNIT-I**

Recapitulation of electrostatics, divergence and curl of a vector field, electric potential, work, energy and conductors, introduction of the Dirac delta function.

## **UNIT-II**

Poisson's equation and Laplace's equation: Boundary conditions and uniqueness theorems, method of images, multipole expansion,

#### **UNIT-III**

Electric field in matter: polarization and dielectrics. Boundary value problems with linear dielectrics.

## **UNIT-IV**

Recapitulation of Magnetostatics: Magnetic fields, magnetic vector potential, multipole expansion, magnetic fields in matter: magnetization, torques and forces on magnetic dipoles, Ampere's law.

## **UNIT-V**

Electrodynamics: electromotive force, electromagnetic induction, induced electric fields, Inductance, Maxwell's equations, modification of Ampere's law, magnetic charge, Maxwell's equations in matter.

IcfaiTech - CURRICULUM&SY/LABUS, IFHE, Hyderabad

(Deemed-to-be-University Under Section 3 of the UGC !!

GHER EDUCATION

1. David J. Griffths, *Introduction to Electrodynamics*, 4 Ed., Cambridge University Press, 2017.

#### **Reference Books:**

- 1. R. P. Feynman, The Feynman Lectures on Physics 2, 2nd ed, Addison-Wesley, 2005.
- 2. J. D Jackson, Classical Electrodynamics, 3rd ed., 1999.

## **Course Outcomes**

# Upon successful completion of the course, student will be able to:

- Calculate fields and potentials for simple charge configurations, both discrete and continuous by applying various laws in electromagnetic theory.
- Have a working knowledge of special techniques like method of images, multipole expansion etc.

## **Skill Development:**

The following aspects are included into the curriculum to enhance the analytical, mathematical and logical thinking abilities of the students. These following tasks will help them to apply physical concepts to various real life situations and areas of engineering and enhance their intuitive abilities with respect to concepts taught in this course.

- 1. Assignments: Assignments as a component of evaluation and will be spread over the entire semester. In this, students will be given numerical and situational questions will be given, related to the concepts taught.
  - a) These will help them to acquire problem solving and critical thinking skills and reasoning abilities allowing them to apply the concepts of physics to real life problems
  - b) Social and organizational skills like time management, team work are the skills which can be acquired
- 2. Review articles and paer presentation: Electrodynamics, in its current form, developed over two centuries. Numerous scientists contributed to the formulation and development of various concepts, both physical and mathematical. This development in electrodynamics along with the undestaing of the quantum nature of light and matter, paved the way for major technological and engineering advances in material science, semiconductor physics, power generation and transmission and communication to name a few. In order that the students develop an appreciation for the subject and its development both historical and scientific, review articles will be given to the students. The student will have to read and present a paper on the given article. Some of the articles, which can be given below. This exercise will enhance their critical thinking and understanding skills. The paper presentation will help to acquire skills on writing and presenting a paper on scientific topic. It will help in building their confidence and public speaking skills.
- 1. Electric field lines: The implications of students' interpretation on their understanding of the concept of electric field and of the superposition principle.

  Esmeralda Campos, Genaro Zavala, Kristina Zuza and Jenaro Guisasola

  American Journal of Physics 37,660 (2019); https://doi.org/10.119/1.5100588

IcfaiTech - CURRICULUM&SYLLARUS, IEHE, Hyderabad

B.So (Physics) and B.Tech.(DS&AI)

THE LOCAL SCHITCHTON FOR RICHER EQUICATION

100 ads to firm

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

- 2. Experiences with the magnetism of conducting loops: Historical instruments, experimental replications, and productive confusions
  American Journal of Physics 71, 156 (2003); https://doi.org/10.1119/1.1507791
- 3. Ampère's motor: Its history and the controversies surrounding its working mechanism American Journal of Physics 80, 990 (2012); https://doi.org/10.1119/1.4746698
- 4. Magnetic monopoles, Galilean invariance, and Maxwell's equations American Journal of Physics 60, 109 (1992); <a href="https://doi.org/10.1119/1.16926">https://doi.org/10.1119/1.16926</a> Frank S. Crawford
- 5. Snapshots of a Physicist's Life
  Annual Review of Nuclear and Particle Science
  Vol.49:1-33 (Volume publication date December 1999)
  https://doi.org/10.1146/annurev.nucl.49.1.1

IcfaiTech - CURRICULUM SYLLABOS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1954)

ADEL AE ADEL

B.Sc (Physics) and B.Tech.(DS&AI)

THE DECKET, 1956)

Course No:	Course Title: Introduction to Statistical Mechanics	L	P	U
PHY314		3	0	3

- To bridge thermodynamics and statistical mechanics
- To develop analytical ability to solve simple problems relevant to statistical mechanics
- To understand approximations making statistical descriptions possible

#### **Course Contents:**

## **UNIT-I**

The Statistical Basis of Thermodynamics: The macroscopic and the microscopic states, Contact between statistics and thermodynamics, Further contact between statistics and thermodynamics, The classical ideal gas, The entropy of mixing and the Gibbs paradox, The "correct" enumeration of the microstates

## **UNIT-II**

Elements of Ensemble Theory: Phase space of a classical system, Liouville's theorem and its consequences, the microcanonical ensemble, Quantum states and the phase space

## **UNIT-III**

The Canonical Ensemble, Equilibrium between a system and a heat reservoir, A system in the canonical ensemble, Physical significance of the various statistical quantities in the canonical ensemble, Alternative expressions for the partition function, The classical systems, Energy fluctuations in the canonical ensemble, Equipartition and the virial theorems, A system of harmonic oscillators, The statistics of paramagnetism, Thermodynamics of magnetic systems

## **UNIT-IV**

The Grand Canonical Ensemble: Equilibrium between a system and a particle-energy reservoir, A system in the grand canonical ensemble, Physical significance of the various statistical quantities, Examples, Density and energy fluctuations in the grand canonical ensemble: correspondence with other ensembles

## **UNIT-V**

Simple gas: An ideal gas in a quantum-mechanical microcanonical ensemble, Ideal Bose gas: Thermodynamic behavior of an ideal Bose gas, Ideal Fermi gas: Thermodynamic behavior of an ideal Fermi gas. Special topics: One dimensional fluid model-Hard Spheres on a ring, The Ising model in one dimension in the absence of external field

FOR H

IcfaiTech - CURRICULUM CYLLABUS, HHE, Hyderabad

(Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Section 3 of the UGC ACT, 1956)

1. R K Pathria, Paul D. Beale, Statistical Mechanics, 3rd Edition, Academic Press, 2011

## **Reference Books:**

1. F. Reif, Statistical Physics: Berkeley Physics Course, Volume 5, Tata McGraw Hill Education Private Limited, 2010

## **Course Outcomes**

# Upon successful completion of the course, student will be able to:

- Learn different statistical ensembles, their distribution functions, ranges of applicability and the corresponding thermodynamic potentials
- Give an account of the macroscopic and microscopic description of temperature, entropy and free energy and their descriptions in terms of probabilities
- Apply the principles of statistical mechanics to selected problems

# Skill development/Employability and Entrepreneurship:

- a. List of numerical experiments -
  - 2. Simulation of ideal gas
  - 3. Simulation of classical models of magnetism
  - 4. Simulation of hard-sphere fluid model
- b. Project work
- c. Presentation

faiTech - CURRICULUM&YLLABUS, IFHE, Hyderabad BSc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 100

MOSTACUTE FEBRUARION

J. of the UGC 4CT 19565

Course No:	Course Title: Atomic, Molecular & Nuclear Physics	L	P	U
PHY315	Course Title: Atomic, Wolecular & Nuclear Physics	3	0	3

- Understand atomic/molecular models
- Understand the quantum laws governing their spectra
- Obtain a basic knowledge of nuclear models and reactions

#### Course Contents:

## **UNIT I**

Bohr's theory, correspondence principle. e/m of the electron, isotopes, isobars, X-ray Spectra: Introduction-production of X-ray, continuous and characteristics of X- ray spectrum, Moseley's law- absorption of X-rays

#### **UNIT II**

Electron angular momentum, spin and spin angular momentum, space quantization, Larmor's theorem, spin magnetic moment, Stern-Gerlach experiment, Zeeman Effect, Anomalous Zeeman effect, Paschen back effect (qualitative discussion)

## **UNIT III**

Vector atom model: Quantum numbers, L-S and j-j couplings, application of spatial quantization, Pauli's exclusion principle. Hund's rule, Optical spectra-Spectral terms and notations, selection rules, intensity rule and interval rule, fine structure of sodium D lines, hyperfine structure, alkali spectra.

#### **UNIT IV**

Molecular spectra: Rotational energy levels, selection rules, vibrational energy levels, selection rules and vibration spectra, Rotation-vibration energy levels, selection rules and rotation-vibration spectra, Raman scattering-classical and quantum theory of Raman scattering, Raman spectra-diatomic molecules, Raman spectrometer.

## UNIT V

Nuclear Structure: nuclear composition, some nuclear properties, stable nuclei, binding energy, liquid-drop Model, shell model, meson theory of nuclear forces, half-Life, radioactive Series, alpha Decay, beta Decay, gamma Decay, cross Section, nuclear reactions and conservation laws, nuclear fission, nuclear reactors, fusion reactors.

IcfaiTech - CURRICULUM& YELABUS, IFHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deamed-to-be-University Under Section 3 of the UGC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR

FOR H

- 1. Rita Kakkar, Atomic and Molecular Spectroscopy, Cambridge University Press, 2015
- 2. C. N. Banwell and E. M. McCash, Fundamentals of Molecular Spectroscopy, 4<sup>th</sup> edition, Tata McGraw Hill, 1994
- 3. Arthur Beiser, Concepts of modern physics, McGraw Hill, 6th ed. 2006.

## **Reference Books:**

1. P. F. Bernath, *Spectra of Atoms and Molecules*, 2<sup>nd</sup> edition, Oxford University Press, 2005

## **Course Outcomes**

# Upon successful completion of the course, student will be able to:

- To analyze atomic/molecular spectra and interpret the data to predict some properties of matter.
- Estimating nuclear binding energies.

IcfaiTech - CURRICU MASY LLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&Al)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION 29: 10A 200 edit to 2 miles (Deemed-to-be-University Under Section 3 of the UGC ACT, 1474)

Course No:	Course Title: Introduction to Monte Carlo Method	L	P	U
PHY317	Course Title: Introduction to Wionte Carlo Methods	3	0	3

- To study some important statistical probability distributions
- To study stochastic modeling and Monte Carlo simulation methods
- To understand the range of applicability of Monte Carlo simulation methods

#### **Course Contents:**

#### **UNIT-I**

Probability theory -- Elements of Probability and Statistics, Special probability distributions and Central limit theorem. Statistical errors, Markov Chains and master equations, Random number generators

#### UNIT-II

Simple sampling Monte Carlo methods- Comparisons of methods for numerical integration of given functions, Boundary value problems, Simulation of radioactive decay, Simulation of transport properties, the percolation problem, Generation of 'random' walks

## **UNIT-III**

Importance sampling Monte Carlo methods- Ising model, Algorithm, Boundary conditions, Finite size effects, Finite sampling time effects, Critical relaxation. Potts model

## **UNIT-IV**

Quantum Monte Carlo methods -- The Ising model in a transverse field, Fermions on a lattice, Continuous time simulations

## **UNIT-V**

Monte Carlo simulations at the periphery of physics and beyond- Astrophysics, Materials science, Chemistry, 'Biologically inspired' physics, 'Traffic' simulations, Econophysics, Finance

#### Text Books:

1.David P. Landau and Kurt Binder, *A Guide to Monte Carlo Simulations in Statistical Physics*, 3rd edition, Cambridge University Press, 2009

#### **Reference Books:**

1. Mark E. J. Newman, G. T. Barkema, *Monte Carlo Methods in Statistical Physics*, Clarendon Press, 1999

HYDERABAD

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Update Section 3 of the UGC ACT, 1956)

## **Course Outcomes**

# Upon successful completion of the course, student will be able to:

- Generate random numbers from some probability distributions
- Use simple and importance sampling Monte Carlo methods
- Apply Monte carlo methods to lattice models

# Skill development/Employability and Entrepreneurship:

# Skill development

List of numerical experiments -

- i. Generation of pseudo-random numbers from probability distributions
- ii. Simulation of radioactive decay
- iii. Simulation of Ising model in the absence of field
- iv. Simulation of Ising model in the external field
- a. Project work
- b. Presentation

IcfaiTech - CURRICULUM&SV LABYS, IFHE, Hyderabad 101 \* B.Sc (Physics) and B.Tech.(DS&AI)

HER BEDDEATHON

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UGC ACT, 1954)

Course No:	Course Title: Classical Mechanics	L	P	U
PHY323		3	0	3

- This course will introduce the students to very powerful techniques of solving not only problems in mechanics but also to demonstrate the far reaching generality of the same.
- The course will introduce generalized coordinates and phase space
- Understand Systems of particles, rigid body dynamics
- Acquire working knowledge of Lagrangian and Hamiltonian formulations.

## **Course Content:**

#### **UNIT I**

Review of Newtonian Mechanics; Application to the motion of a charge particle in external electric and magnetic fields- motion in uniform electric field, magnetic field- gyroradius and gyrofrequency, motion in crossed electric and magnetic fields.

## **UNIT II**

Generalized coordinates and velocities, Hamilton's principle, Lagrangian and the Euler-Lagrange equations, one-dimensional examples of the Euler-Lagrange equation.

## **UNIT III**

Canonical momenta & Hamiltonian. Legendre transformation and Hamilton's equations of motion. Examples using of the Hamiltonian equations of motion. The principle of least action.

## **UNIT IV**

Canonical transformations, examples of canonical transformations. The Symplectic approach to canonical transformations. Poisson brackets and other canonical invariants. Liouville's theorem.

#### **UNIT V**

Hamilton-Jacobi equation for Hamilton's principal function. Separation of variables in Hamilton-Jacobiequation. Action-angle variables. [10 Lectures]

## **Text Books:**

1. Classical Mechanics, N. C. Rana and P. S. Joag, Tata McGraw-Hill, 2017.

2. Classical Mechanics, H. Goldstein, C. P. Poole, and J. Safko, 3rd Ed., Tata McGraw-Hill, 2011.

IcfaiTech — CURRICULUM SY ELEVENTS, BLATE, Hyderabad
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

## **Reference Books:**

- 1. Variational Principles of Mechanics, C. Lanczos, Dover 1987.
- 2. Theoretical Mechanics, M.R. Spiegel, Tata McGraw Hill, 2006.

## **Course Outcomes**

# Upon successful completion of the course student will be able to:

- Use variational calculus to find the Euler Lagrange equations
- Obtain Hamilton's equations of motion for different systems.
- Understanding algebraic structure of Poisson brackets.
- The student would have understood small oscillations and the motion of rigid bodies.

HYDERABAD PIDERABA

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UGC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

TOTAL BHY

Course No:	Course Title: Nanotechnology	L	P	U
PHYC324	Course Title: Nanotechnology	3	0	3

- To introduce and provide a broad view of the field of nanoscience and nanotechnology to undergraduates
- To provide knowledge on the various synthesis and characterization techniques.
- To introduce students to the applications of nanomaterials

#### **Course Content:**

## **UNIT I**

Nanoscale systems: Length scales in physics, Nanostructures: nano dots, thin films, nanowires, nano rods, Band structure and density of states of materials at nanoscale, Size Effects in nano systems, Quantum confinement: Applications of Schrodinger equation-Infinite potential well, potential step, potential box, quantum confinement and its consequences.

## **UNIT II**

Synthesis and characterisation of nanostructure: Top down and Bottom up approach, Photolithography. Ball milling. Gas phase condensation. Vacuum deposition. PVD, CVD and MBE growth of quantum dots.

#### UNIT III

Characterisation: X-Ray Diffraction. Optical Microscopy. Scanning Electron Microscopy. Transmission Electron Microscopy. Atomic Force Microscopy. Scanning Tunneling Microscopy.

## **UNIT IV**

Optical Properties: Coulomb interaction in nanostructures. Concept of dielectric constant for nano structures and charging of nanostructure. Quasi-particles and excitons. Excitons in direct and indirect band gap semiconductor nanocrystals. Electron Transport: Carrier transport in nanostructures. Coulomb blockade effect, thermionic emission, tunneling and hoping conductivity. Defects and impurities

## **UNIT V**

Applications: Applications of nanoparticles, quantum dots, nanowires and thin films for photonic devices. Single electron transfer devices. CNT based transistors. Nanomaterial Devices: Quantum dots hetero-structure lasers, optical switching and optical data storage. Magnetic quantum well; magnetic dots -magnetic data storage.

IcfaiTech - CURRICULUM&SYULABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

#### **Text Books:**

1. K.K. Chattopadhyay and A. N. Banerjee, *Introduction to Nanoscience and Technology*, PHI Learning Private Ltd, 2009

## **Reference Books:**

- 1. Charles P.Poole.Jr.& Frank J.ownes, *Introduction to Nano technology*, John Wiley & sons Inc. Publishers, 2006
- 2. Guozhong Cao, Nano structures and Nano materials: Synthesis, properties and Applications, Imperial College Press, 2 ed, 2004.
- 3. Jackie Ying, Nano structured Materials, Academic press, 2001Learning outcomes

## **Course Outcomes**

# Upon successful completion of the course student will be able to:

- describe the basic science behind the properties of materials at the nanometre scale,
- understand the various techniques of preparation of nano-materials
- describe the principles behind experimental techniques for studying nanomaterials.
- understand the inter-disciplinary applications of nanotechnology

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICEAL FOUNDATION FOR HIGHER STUDGATION

Course No:	Course Title Special Theory of Deletivity	L	P	U
PHY325	Course Title: Special Theory of Relativity	3	0	3

- To understand the inadequacy of Newtonian mechanics for exteremely fast moving objects.
- Einstein's solution to the breakdown of Galilean relativity.
- Relativistic kinematics and Reltivistic dynamics.

## **Course Contents:**

## **UNIT-I**

Special Theory of Relativity: Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity.

#### UNIT-II

Lorentz Transformations. Simultaneity and order of events. Lorentz contraction. Time dilation. Relativistic transformation of velocity, frequency and wave number.

#### **UNIT-III**

Relativistic Kinematics: Relativistic addition of velocities, Doppler Effect, Stellar aberration. Time dilation, four vectors.

## **UNIT-IV**

Relativistic Dynamics: Redefining momentum, Equivalence of mass and energy. Collisions elastic and inelastic. Applications like Mossbauer Effect and creation of particles.

#### UNIT- V

Field of a maoving charge, forces and fields near a current carrying wire, invariance of maxwells equations, limitations of special relativity.

HYDERABAD TO

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad REGISTRAR

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University 1984 - Section 3 of the UGC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&A1)

THE IOSAIPCIANT

## **Text Books:**

- 1. R. Resnick, Introduction to Special Relativity, John Wiley and Sons, 2005.
- 2. A.P. French, Special Relativity, MIT Introductory Series, 1968.

#### Reference Books:

1. WGV Rosser, Introductory Special Relativity, Taylor and Francis, London, 1991.

## **Course Outcomes**

# Upon successful completion of the course, student will be able to:

- Understand the role of Newtonian mechanics in the larger framework of mechanics.
- Understand the theoretical underpinnings of the mass-energy equivalence.
- Understand the role of special relativity in electrodynamics.

# Skill development/Employability and Entrepreneurship:

The following aspects are included into the curriculum to enhance the analatycal, mathematical and logical thinking abilities of the students. These following tasks will help them to apply physical concepts to various reallife situations and areas of engineering and enhance their intuitive abilities with respect to concepts taught in this course.

- 1. Assignments: The course has assignments as a component of evaluation and these are spread over the entire semester. In this, students are given numericals.
  - a) These will help them to acquire problem solving and critical thinking skills and reasoning abilities allowing them to apply the concepts of physics to real life problems
  - b) Social and organizational skills like time management, team work are the skills which can be acquired
- 2. Experiments: Michelson-Morley experiment

The skills that can be developed include

- 1. Associating the experiment to the relavent concepts
- 2. Understanding the principles and the working of various equipment and tools used.
- 3. Correct usage of equipment
- 4. data collection and organization
- 5. graphical and numerical analysis of data
- 6. interpretation of experimental results and arriving at conclusions
- 7. Writing a technical report

In addition, the social and organizational skills developed are team work, coordination, time management, collaboration and communication.

FOR HIGH

HYDERABAD

3. Research paper study and presentation

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderaba

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1954)

The students will be asked to read and present the research paper by John P. Costella, Bruce H. J. McKellar, and Andrew A. Rawlinson, Thomas Rotation, American Journal of Physics 69, 837 (2001). This paper is specifically written for the undergraduates and this will help the students to self learn, improve their presentation skills and also their reasoning abilities.

HYDERABADI TO

IcfaiTech - CURRICULUM SEX GLOBERS, FHE, Hyderabad THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Finder Section 3 of the USC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

Course No:	Course Title Introduction to Accustics	L	P	U
PHY326	Course Title: Introduction to Acoustics	3	0	3

- To provide an introductory view to a wide range of acoustic phenomena, including the theory and principles of acoustics.
- Sound propagation in the atmosphere and non-linear acoustics in fluids.
- Understanding of acoustic measurements and analysis of acoustic signals.

## **Course Contents:**

## **UNIT I**

Introduction to acoustics: Acoustics: The science of sound, sounds we hear, sounds we cannot hear: Ultra sound and infra sound, Sounds we would rather not hear: Environmental noise control, Aesthetic sound: Music, Sound of the Human voice: Speech and singing, How we Hear: Physiological and Psychological acoustics, Architectural acoustics, Harnessing Sound, Medical Acoustics, sounds of the sea. Propagation of sound: History of acoustics: Acoustics in ancient times, early experiments on vibrating strings, membranes and plates, speed of sound in air, liquids and solids, determining frequency, acoustics in 19th and 20th century, conclusion.

#### UNIT II

Basic linear acoustics: Introduction, equations of continuum mechanics, equations of linear acoustics, variational formulations, waves of constant frequency, plane waves, attenuation of sound, acoustic intensity and power, impedance, reflection and transmission, spherical waves, cylindrical waves, simple sources of sound, Integral equations in acoustics, waveguides, ducts and resonators, ray acoustics and diffraction.

## **UNIT III**

Sound propagation in the atmosphere: A short history of outdoor acoustics and its applications, spreading losses, atmospheric absorption, diffraction and barriers, ground effects, attenuation through trees and foliage, wind and temperature gradient effects on outdoor sound.

## **UNIT IV**

Non-linear acoustics in fluids: Origin of nonlinearity, equation of state, The non-linearity parameter, the coefficient of nonlinearity, simple nonlinear waves, lossless finite-amplitude acoustic waves, thermoviscous finite-amplitude acoustic waves, shock waves, interaction of non-linear waves, bubbly liquids, sono luminescence and acoustic chaos.

**UNIT V** 

IcfaiTech - CURRICHE UNICSVILLABUS, IFHE, Hyderabau
THE ICFAI FOUNDATION FOR HIGHER EDUCATION

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 1956)

HYDERABAD B.S. (Physics) and B.Tech.(DS&AI)

Acoustic signal processing: Definition, Fourier Series, Fourier transform, Power, energy and power spectrum, statistics, Hilbert transform and the envelop, Filters, Noise, sampled data, Discrete Fourier transform, The z-transform, Maximum length sequences and Information theory.

#### **Text Books:**

1. Handbook of Acoustics, Edited by Thomas D. Rossing, Second edition, Springer, 2015.

#### **Reference Books:**

1. Fundamentals of Acoustics, Lawrence E. Kinsler, Austin R.Frey, Alan B. Coppens and James V. Sanders, Fourth edition, John Wiley and Sons, Inc., 2000.

#### **Course Outcomes**

# Upon successful completion of the course, student will be able to:

- Develop a strong understanding of scientific principles underlying the generation and propagation of sound.
- Obtain working knowledge of advanced methods for acoustic signal processing.

**Skill development/Employability and Entrepreneurship:** Skill development.

## List of activities:

- (a) Literature survey.
- (b) Report writing

# **Experiments**

Hands on experience how to collect the acoustic data in laboratory-field visit.

## **Training on Software**

Hands on experience through the analysis of acoustic data using Origin Pro software.

HYDERABAD

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

Course No:	Course Title: Introduction to Quantum	L	P	U
PHY327	Computation	3	0	3

- To expose the students to the fundamental concepts of quantum computation and information.
- Generalisation of the usual bit concept from computer science that incorporates the quantum phenomena.
- To learn three quantum algorithms and show that they are sueprrior to classical algorithms

#### **Course Contents:**

## **UNIT-I**

Dirac notation and Hilbert spaces, dual vectors, linear operators. The spectral theorem, functions of operators. Tensor products, Schmidt decomposition theorem.

#### **UNIT-II**

State of a quantum system, time-evolution of a closed quantum system, measurement in quantum mechanics. Pure and mixed states, density operator, partial trace, general quantum operators. Bloch-sphere representation of single qubit states, qubit rotations, single qubit gates.

#### **UNIT-III**

The quantum circuit model, single and multi-qubit operations, universal sets of quantum gates. Efficiency of approximating unitary transformations, implementing measurements with quantum gates.

## **UNIT-IV**

Probabilistic versus quantum algorithms. Phase kick-back. The Deutsch and Deutsch-Jozsa algorithms. Quantum phase estimation and quantum Fourier transform, error analysis in arbitrary phase estimation. Finding orders, Shor's algorithm for order estimation. Quantum algorithms based on amplitude amplification, Grover's quantum search algorithm and related topics.

#### **UNIT-V**

Mathematical and physical conceptions of quantum entanglement, entanglement distillation, entanglement of formation. Entanglement in pure and mixed states. No-cloning theorem for quantum states.

## **Text Books:**

1. M. A. Nielsen and I. L. Chuang Quantum Computation and Quantum Information, Cambridge University Press, 2012.

(9561 137 390 mg. g)

IcfaiTech - CURRICULUM& SVILLABUS, IFHE, Hyderathad

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION

Commodito be University Under Section 3 of the UG

## Reference Books:

1. D.M. McMahon, Quantum computing explained, John Wiley & Sons, 2007.

#### Course Outcomes

# Upon successful completion of the course, student will be able to:

- Apply concepts from linear algebra to construct quantum gates.
- Understand the working of three quantum algorithms.
- Will understand the crucial concept of entanglement.

# Skill development/Employability and Entrepreneurship:

The following aspects are included into the curriculum to enhance the analatycal, mathematical and logical thinking abilities of the students. These following tasks will help them to make a connection between basic science course and engineering.

- 1. Assignments: The course has assignments as a component of evaluation and these are spread over the entire semester. In this, students are given numericals.
  - a) These will help them to acquire problem solving and critical thinking skills and reasoning abilities allowing them to apply the concepts of physics to real life problems
  - b) Social and organizational skills like time management, team work are the skills which can be acquired

HYDERABAD TO

IcfaiTech - CURRICULIMESYLIABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

M.Sc (Physics) and B.Tech.(DS&AI)

THE ICEAL FOUNDATION ON I

Course No	Course Title	L	Р	U
HS 311	Dynamics of Social Change	3	0	3

# **Learning Objectives**

The objective of this course is to enable students to have an insight into the social processes, sociological thought, methodology, sociological concepts and recent trends in modernization so as to empower the students to become active citizens. Sociological study aids in comprehending one's identity, thinking and action, it makes one more tolerant of human differences.

#### **Course Contents:**

## Unit I

Sociology: its fundamentals, development of its methods and theories; Sociology and its relationship with other social sciences. Society: concepts and theories. Socialization and its theories, Social groups: Crowd Community, Association, Institutions.

#### Unit II

Family & Marriage: concepts, theories of origin; types, functions and changing patterns. Demographic transition.

Culture and its determinants: Social norms, Folkways, Mores, Taboos, Social roles, Social responsibility. Culture and personality.

#### Unit III

Social stratification: Caste, class, their functions and changing patterns.

Social Change: Concepts, Theories and Process and Dynamics of social change, Factors, Resistance to social change.

#### Unit IV

Modernization Concept: Industry and social change, Urbanization and rural sociology.

The role of education as a vital force for social change and to highlight the role of social institutions in educational and social developments.

## Unit V

Sociology of Religion: Aspects, origin, Hinduism. Social disorganization and delinquency.

#### **Text Book**

Fundamentals of Sociology, Gisbert P, Orient Longman, 3rd Edition, 1994.

IcfaiTech – CURRICULUM&SYLLABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDU

B.Sc (Physics) and B.Tech.(DS&AI)

# Reference book(s)

- 1. Sociology Systematic Introduction. Johnson.M. Harry. Allied Publishers, 2001
- 2. Sociology A Guide to Problems and Literature. Bottomore T. T. Blackie & Sons, 1986.

# **Learning Outcomes:**

After going through this course, the student will be able to:

- Define what social change is.
- Differentiate between social change and cultural change.
- Understand various characteristics of social change.
- Understand various sources of social change.
- Understand various factors of social change.
- Understand various theories of social change given by various sociologists.
- Understand the role of education for social change.

HYDERABADIES NOING

IcfaiTech - CURRICULUM&SYLLABUS FHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICEAN FOOTING AT MICHELLER IN

Carrie No. 118212	Course Title Introduction to Dayshalogy	L	P	U
Course No: HS312	Course Title: Introduction to Psychology	3	0	3

# Learning Objectives

- To familiarize the students with type concepts of mind processes, motives, reactions, feelings, motivation
- To inculcate group thinking
- To develop skills like conflict resolution, crisis management

#### **Course Content**

## **UNIT I**

Introduction: Definition of psychology; historical antecedents of psychology and trends in the 21st century; psychology and scientific methods; psychology in relation to other social sciences and natural sciences; application of psychology to societal problems.

Methods of psychology: Types of research, descriptive, evaluative, diagnostic and prognostic; methods of research: survey, observation, case-study and experiments; characteristics of experimental design and non-experimental design, quasi-experimental designs; focussed group discussions, brain storming, grounded theory approach.

## UNIT II

Development of Human Behaviour: Growth and development; principles of development, role of genetic and environmental factors in determining human behaviour; influence of cultural factors in socialization; life span development, characteristics, development tasks, promoting psychological well-being across major stages of the life span.

Sensation, attention and perception: Sensation; concepts of threshold, absolute and difference thresholds, signal-detection and vigilance; factors influencing attention including set and characteristics of stimulus; definition and concept of perception, biological factors in perception; perceptual organization-influence of past experiences, perceptual defence-factors influencing space and depth perception, size estimation and perceptual readiness; the plasticity of perception; extrasensory perception; culture and perception, subliminal perception.

#### UNIT III

Learning: Concept and theories of learning (behaviourists, gestaltalist and information processing models); the processes of extinction, discrimination and generalization; programmed learning, probability learning, self-instructional learning, concepts; types and the schedules of reinforcement, escape, avoidance and punishment, modeling and social learning. Memory: Encoding and remembering; short term memory, long term memory, sensory memory, iconic memory, echoic memory: the multistore model, levels of processing; organization and mnemonic techniques to improve memory; theories of forgetting: decay, interference and retrieval failure: metamemory; amnesia: anterograde and retrograde.

Motivation and emotion: Psychological and physiological basis of motivation and emotion; measurement of motivation and emotion; effects of motivation and emotion on behaviour; extrinsic and intrinsic motivation; factors influencing intrinsic motivation; emotional competence and the related issues.

**UNIT IV** 

IcfaiTech - CURRICULUMAS VILLABUS, IFHE, Hyders and DERABA

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT 1994

BSc (Physics) and B.Tech.(DS&AI)

Thinking, problem solving: Piaget's theory of cognitive development; concept formation processes; information processing, reasoning and problem solving, facilitating and hindering factors in problem solving, methods of problem solving: creative thinking and fostering creativity; factors influencing decision making and judgment; recent trends.

Intelligence and aptitude: Concept of intelligence and aptitude, nature and theories of intelligence - Spearman, Thurstone, Gullford Vernon, Sternberg and J.P; Das; emotional intelligence, social intelligence, measurement of intelligence and aptitudes, concept of IQ, deviation IQ, constancy of IQ; measurement of multiple intelligence; fluid intelligence and crystallized intelligence.

#### **UNIT V**

Personality: Definition and concept of personality; theories of personality (psychoanalytical, sociocultural, interpersonal, developmental, humanistic, behaviouristic, trait and type approaches); Measurement of personality (projective tests, pencil-paper test); The Indian approach to personality; training for personality development; latest approaches like big 5 factor theory; the notion of self in different traditions.

Work Psychology and Organisational Behaviour: Personnel selection and training; use of psychological tests in the industry; training and human resource development; theories of work motivation, Herzberg, Maslow, Adam Equity theory, Porter and Lawler, Vroom; Leadership and participatory management; advertising and marketing; stress and its management; ergonomics; consumer psychology; managerial effectiveness; transformational leadership; sensitivity training; power and politics in organizations.

## **Text Books**

- 1. Passer, M.W. and Smith, R.E. (2010). *Psychology: The science of mind and behavior*. 4th edn. Boston, MA, USA: McGraw-Hill Higher Education.
- 2. Pareek, U. and Khanna, S. (2012). *Understanding organizational behaviour*. 3rd edn. New Delhi, India: Oxford University Press.

## **Reference Books**

- 1. Luthans, F. (2010). *Organizational behavior: An evidence-based approach.* 12th edn. New York, NY, USA: McGraw Hill Higher Education.
- 2. Morris, C.G. and Maisto, A.A. (2004). *Psychology: An introduction*. 12th edn. Harlow, United Kingdom: Prentice Hall.

## **Learning Outcomes**

Upon successful completion of the course student will be able to:

- Use critical thinking to evaluate and interpret evidence, and to apply psychological concepts, theories, and research findings to individual, social, and cultural issues
- Apply basic research methods in psychology, with sensitivity to ethical principles
- Demonstrate effective communication skills following professional conventions in psychology appropriate to purpose and context
- Understand the complexity of sociocultural diversity and societal inequality in the inquiry and analysis of psychological issues on FOR Mo

HYDERABADIE

IcfaiTech - CURRICULUM&VLLABUS, IFHE, Hyderattad RSC (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deamod-to-be-University Under Section (CACT, 1956))

Course No	Course Title	L	P	U
HS313	Heritage of India	3	0	3

# **Learning Objectives**

Comprehending the heritage of the nation is a necessary pre condition for the making of conscientious citizenship. Knowledge of the nation's evolution and legacy enables to precisely define one's national self. Hence, this course is designed to serve the objective of enabling the students to take stock of the heritage and cultural evolution of their nation and its syncretic history.

## **Course Contents:**

## UNIT I: Indian Culture: An Introduction

Characteristics of Indian culture, Significance of Geography on Indian Culture. Society in India through ages- Ancient period- varna and jati, family and marriage in india, position of women in ancient india, Contemporary period; caste system and communalism. Religion and Philosophy in India: Ancient Period: Pre-Vedic and Vedic Religion, Buddhism and Jainism, Indian philosophy – Vedanta and Mimansa school of Philosophy.

## **UNIT II:** Indian Languages and Literature

Evolution of script and languages in India: Harappan Script and Brahmi Script. Short History of the Sanskrit literature: The Vedas, The Brahmanas and Upanishads & Sutras, Epics: Ramayana and Mahabharata & Puranas. History of Buddhist and Jain Literature in Pali, Prakrit and Sanskrit, Sangama literature & Odia literature.

## UNIT III: A Brief History of Indian Arts and Architecture

Indian Art & Architecture: Gandhara School and Mathura School of Art; Hindu Temple Architecture, Buddhist Architecture, Medieval Architecture and Colonial Architecture. Indian Painting Tradition: ancient, medieval, modern indian painting and odishan painting tradition. Performing Arts: Divisions of Indian classical music: Hindustani and Carnatic, Dances of India: Various Dance forms: Classical and Regional, Rise of modern theatre and Indian cinema.

# UNIT IV: Spread of Indian Culture Abroad

Causes, Significance and Modes of Cultural Exchange - Through Traders, Teachers, Emissaries, Missionaries and Gypsies, Indian Culture in South East Asia, India, Central Asia and Western World through ages.

UNIT V: Understand and appreciate the heritage of India in various fields of applied sciences

faiTech - CURRICULUM&SY LABUS, IFHE, Hydradhid / B.Sc (P

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGCACT, The Education 3 of the UGCACT, The UGCACT,

B.Sc (Physics) and B.Tech.(DS&A1)

Applied Sciences: Geography, Astronomy, Mathematics, Physics, Chemistry, Physiology, Medicine, Coinage, Weights and Measures, India's contribution to the world civilizations and the external influences on Indian Heritage

#### **Text Books**

Basham, A.L, The Wonder That was India, Picador, London, 2004.

#### Reference Books

- 1. Nehru, Jawaharlal, the Discovery of India, Jawaharlal Memorial Fund, New Delhi, 1999.
- 2. Thapar, Romila, The History of India, Vol. I, Penguin, New Delhi, 1966
- 3. Basham, A.L, ed., A Cultural History of India, Penguin, New Delhi, 1988.
- 4. Jha, D.N, Ancient Indian in Historical Outline, Manohar, New Delhi, 2004.
- 5. Wolpert, Stanley, an Introduction to India, Penguin, New Delhi, 1994.
- 6. Mazumdar, R.C, et.al, an Advanced History of India, MUP, Michigan, 1969.
- 7. Malekandathil, Pius: Maritime India: Trade, Religion and Polity in the Indian Ocean, Primus Books, Delhi, 2010.
- 8. McPherson, Kenneth: The early Maritime Trade of the Indian Ocean, in: ib.: The Indian Ocean: A History of People and The Sea, OUP, 1993, pp. 16-75.
- 9. Christie, J.W., 1995, State formation In early Maritime Southeast Asia, BTLV

IcfaiTech - CURRICULUM&SYLLABOS, IFHE, Hyderabad B. Physics) and B. Tech. (DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Decimed to be University Under Section 3 of the UGC ACT, 1956)

Course No	Course Title	L	Р	U
HS314	Modern Political Science	3	0	3

## **Objectives**

- To familiarise the students with the basic ideas of political science.
- To make them thorough in the concepts of political theory.
- To help them understand and distinguish between basic concepts like political theory, political thought and political philosophy.
- To help the students understand and relate the concepts and facts with the political realities of the country and different parts of the world.
- To equip them with the basics of the discipline and help them learn the basic underpinnings of the subject of Political Science.

# Unit I Political Theory

Nature, scope and significance of political theory, procedure of different theoretical ideas in political theory, the various traditional and modern theories of political science., theories of origin of the state.

# Unit II Political Theory

Concept of Democracy, its types and theories (Elitist, Pluralist and Marxist) relating to it, concept of Development and various views and Perspective relating to it. i.e. Liberal, Marxist, Sustainable Development, Human Development and Gandhian Model of Development, Understanding basic concepts of Justice, distributive justice, multiculturalism and social justice.

#### Unit III Politics in India

Philosophy of Indian constitutions, introducing the Indian Constitution with a focus on the evolution of it and examining the essence of the Preamble, e Fundamental Rights and Duties of Indian citizens with a study of the significance and status of Directive Principles.

Analyzing the important institutions of the Indian Union: the Executive: President; Prime Minister, Council of Ministers; Governor, Chief Minister and Council of Ministers; The legislature: Rajya Sabha, Lok Sabha, Speaker, Committee System, State Legislature, The Judiciary: Supreme Court and the High Court: composition and functions-Judicial Activism

## Unit IV Politics in India

Centre-State Relations with focus on the Legislative, Administrative and Financial Relations., evaluating the Indian Party system – its development and looking at the ideology of dominant national parties, the Electoral Process in India with focus on the Election Commission: Composition, Functions and Role, the challenges to National Integration: Terrorism, Regionalism and Casteism.

Unit V International Relations

IcfaiTech - CURRICULUMAS LLABUS, IFHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the 1950 ACT

(Physics) and B.Tech.(DS&A1)

THE IOFAL FOUNDANT.

Overview about the nature, evolution and scope of international relations, the basic ideas of international relations, the different approaches to the study of International Relations, historical background of the discipline which will help them understand international politics in a better way, basic concepts of International Relations and also develop a preliminary understanding of the global economy, formation, charter and objectives of United Nations and its working on Millennium Development Goals, the working of United Nations in resolving conflict and peacekeeping operations, the international security; Disarmament, Arms Control and Nuclear nonproliferation

## **Text Books:**

- 1. J.C. Johari "Principles of Modern Political Science", Sterling Publishers PVT. Ltd., New Delhi, 2007
- 2. Perter Harris, "Foundations of Political Science", Oxford University Press

#### References:

- 1. Amal Ray and Mohit Bhattacharya "Political Theory: Institutions and Ideas" The World Press Private Ltd., Calcutta, 1988
- 2. O.P. Gauba "An Introduction to Political theory" Macmillan India Ltd., 2008.
- 3. Robert Dahl "Modern political Analysis." OUP 2007
- 4. Prof. A.C Kapoor "Principles of Political Science", Sterling Publishers PVT. Ltd., New Delhi, 2005

## **Course Outcomes:**

- Understanding of government institutions, electoral processes, and policies in a variety of countries around the world and the ability to compare the effectiveness or impact of various political arrangements across countries.
- Knowledge of some of the philosophical underpinnings of modern politics and government and the legal principles by which political disputes are often settled.
- Understand the changes in patterns of political behaviour, ideas and structures.
- Assess how global, national and regional developments affect polity and society.
- Develop the ability to make logical inferences about social and political issues on the basis of comparative and historical knowledge.
- Knowledge of key theories and concepts, historical developments, organizations, and modern issues in international relations.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderahad S.Sc (Physics) and B.Tech.(DS&AI)

HYDERABA

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Suction 3 of the UGC ACT, 1956)

Course No	Course Title	L	Р	U
HS315	Public Administration	3	0	3

# **Learning Objectives**

The course on Public Administration/Management has following objectives:

- 1. Understand the concept of public administration/ management/organization
- 2. Understand the evolution of the concept of public administration and its importance
- 3. Understand the role of government
- 4. Understand the role and core functions of public manager
- 5. Understand the structure of government /organizations
- 6. Create understanding about the skills required by the public manager in imparting duties
- 7. Understand the changing role of government and role of public managers.

#### **Course Contents:**

#### Unit I

#### Introduction:

Meaning, scope, and significance of Public Administration, Wilson's vision of Public Administration, Evolution of the discipline and its present status, New Public Administration, Public Choice approach, Challenges of liberalization, Privatisation, Globalisation, Good Governance: concept and application, New Public Management

## Unit II

Administrative Thought, Scientific Management and Scientific Management movement, Classical Theory, Weber's bureaucratic model — its critique and post-Weberian Developments, Dynamic Administration, Human Relations School, Functions of the Executive, Simon's decision-making theory, Participative Management.

## Unit III

Administrative Behaviour, Process and techniques of decision-making, Communication; Morale Motivation Theories – content, process and contemporary, Theories of Leadership: Traditional and Modern

Organisations - Theories — systems, contingency, Structure and forms:ministries & departments, corporations, companies, boards, commissions, ad hoc and advisory bodies, headquarters and field relationships, regulatory authorities, public-private partnerships.

## **Unit IV**

Accountability and control - Concepts of accountability and control; Citizen and Administration, Legislative, Executive and Judicial control over administration, Role of media, interest group: & voluntary organizations Civil society, Citizen's Charters, Right to Information, Social audit.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

BSc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemedto-be-University Under Section 3 of the U.S.)

THE BOOK ACT, 1954.

## Unit V

Administrative Law - Meaning, scope, and significance, Dicey on Administrative law, Delegated legislation, Administrative Tribunals.

Comparative Public Administration - Historical and sociological factors affecting administrative systems, Administration and politics in different countries, Current status of Comparative Public Administration, Ecology and administration, Riggsian models and their critique,

Techniques of Administrative Improvement - Organisation and methods, Work-study and work management, Management aid tools like network analysis, MIS, PERT, CPM, egovernance and information technology.

## **Text Book:**

- 1. Baker, R.J.S., 1972, Administrative Theory and Public Administration, Hutchinson University Library, London.
- 2. Bhattacharya, Mohit, 1998, New Horizons of Public Administration, Jawahar Publishers & Distributors, New Delhi.

#### References:

- 1. Bertram, M. Gross, 1964, The Managing of Organisations, The Administrative Struggle, The Free Press of Glencoe, CollierMacmillan., London.
- 2. Denhardt, Robert B. and Joseph W. Grubbs, 2003, Public Administration: An action Orientation, Fourth Edition, Thomson (Wadsworth), Canada.
- 3. Prasad, D. Ravindra, V.S. Prasad and P. Satyanarayan, 2004, Administrative Thinkers (Ed), Sterling Publishers, New Delhi.
- 4. Pugh, D.S., 1985, Organisation Theory: Selected Readings (Ed), Penguin Books, Middlesex, England.
- 5. Sharma, M.P. and B.L. Sardana, 1988, Public Administration in Theory and Practice, Kitab Mahal, New Delhi.
- 6. Srivastava, Om Prie, 1991, Public Administration and Management, The Broadening Horizons, Volume 1, Himalaya Publishing House, Delhi

#### **COURSE OUTCOMES:**

- To understand the nature and scope of Public Administration;
- To appreciate the methodological pluralism and synthesizing nature of knowledge in Public Administration;
- To comprehend the changing paradigms of Public Administration;
- To acquaint with the theories, approaches, concepts and principles of Public Administration;
- To understand the administrative theories and concepts to make sense of administrative practices.

• To Understand public administration theory and concepts from multiple perspectives

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hydera HYDERABARISE Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR THE ICFAI FOUNDATION FOR THE ICFAI FOUNDATION FOR THE ICFAI HE UGC ACT, 1956)

Comma Navi IIC216	Course Title: Professional Ethics	L	P	U
Course No: HS316	Course Title: Professional Ethics	3	0	3

# **Learning Objectives**

- To create an awareness on Ethics as applied in Engineering and Human Values
- Understand what morality is and how it connects to professional ethics
- Determine what characterizes a professional and distinguishes one from a nonprofessional

#### **Course Content**

## **UNIT I**

Morals, values and ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, caring, sharing, honesty, courage, valuing time, co-operation, commitment, empathy, self-confidence, character, spirituality.

## UNIT II

Senses of 'Engineering Ethics', variety of moral issued, types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, consensus and controversy, models of professional roles, theories about right action, self-interest, customs and religion, uses of ethical theories.

#### **UNIT III**

Engineering as experimentation, engineers as responsible experimenters, codes of ethics, a balanced outlook on law, the challenger case study.

# **UNIT IV**

Safety and risk, assessment of safety and risk, risk benefit analysis and reducing risk, the Three Mile Island and Chernobyl case studies. Collegiality and loyalty, respect for authority, collective bargaining, confidentiality, conflicts of interest, occupational crime, professional rights, employee rights, Intellectual Property Rights (IPR), discrimination.

## **UNIT V**

Multinational corporations, environmental ethics, computer ethics, weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India, etc.

## **Text Books**

1. Martin, M.W. and Schinzinger, R. (2004). *Ethics in engineering*. 4th edn. Boston, MA, USA: McGraw Hill Higher Education.

2. Govindarajan, M., Natarajan, S. and Senthilkuman, S. (2004). Engineering ethics. New Delhi, India: Prentice-Hall of India Pvt

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

B.ScoPhysics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

THE ICEAL FOUNDATION

HYDERABAR

## Reference Books

- 1. Fleddermann, C.B. (2011). *Engineering ethics*. 4th edn. Boston, MA, USA: Prentice Hall.
- 2. Harris, J.C.E., Rabins, M.J., Pritchard, M.S., James, R. and Englehardt, E. (2013). *Engineering ethics: Concepts and cases*. 5th edn. Boston, MA, USA: Wadsworth Cengage Learning.
- 3. Boatright, J.R. (2011). *Ethics and the conduct of business*. Boston, MA, USA: Pearson College Div.
- 4. Seebauer, E.G. and Barry, R.L. (2010). Fundamentals of ethics for scientists and engineers. New York, NY, USA: Oxford University Press.

# **Learning Outcomes**

Upon successful completion of the course student will be able to:

- Choose their own personal, social, moral and spiritual values and be aware of practical methods for developing and deepening
- Assess their own ethical values and the social context of problems
- Identify an ethical issue and analyze that issue in relationship to the specific topic of study or discipline

IcfaiTech - CURRICULEM SYLLABUS, IFHE Hyderabad

REGISTRAR

THE ICFAI FOUNDATION FOR HIGHER CONCATION

T, 1956)

(Deemed-to-be-University Under Section

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICEA) PENINDATION FOR HIGHER (Decimed) Inc. Co. Co. 3 of the

# B.Tech Data Science and Artificial Intelligence Program (DS & AI) Course Handouts

Cause No. DC211	Course Title: Discrete Structures for Computer	L	P	U
Course No: <b>DS211</b>	Science	3	0	3

# **Course Learning Objectives**

- To write an argument using logical notation and determine if the argument is or is not valid
- To write and evaluate a proof or outline the basic structure of and give examples of each proof technique
- To understand the basic principles of sets and operations in sets
- To understand the basics of Boolean Algebra and Lattices
- To design and analysealgorithms
- To study finite state machines
- To understand phrase structure grammars
- To introduce error-correcting codes
- To applyNumber Theory in cryptography.

## **Course Contents**

## **UNIT-I**

Statement of Addition Principle, Sequences, Strings, Characteristic Function, Matrices, Boolean matrix operations Mathematical Structures, Logic, Logical Operations, Quantifiers, Conditional Statements,

## **UNIT-II**

Methods of proof, Mathematical Induction, permutation, combinations. Pigeonhole Principle, Recurrence relations, Generating functions, Relations and Directed Graphs, Paths in relations and directed, Equivalence relation and partitions,

## **UNIT-III**

Graphs, Euler paths and Circuits, Hamiltonian paths and Circuits, Colouring Graphs, Chromatic polynomial, Closure and transitive closure, Warshall's Algorithm

## **UNIT-IV**

Partially Ordered sets, Lattices, Hasse diagram, Boolean algebra and Boolean Expressions, Trees and their representations, labeled trees, Undirected trees, spanning trees, Minimal Spanning Trees, Prim's and Kruskal's algorithms for minimal spanning tree in a connected graph

# **UNIT-V**

Definition of group and semi group, Languages and finite state machines, Coding of Binary information and Error detection, Error Correction, Factorization of integers, Greatest common divisor, residues, Fermat's theorem and RSA

IcfaiTech - CURRICULUM&SYNLABUS, IFHE, Hyderabad BISc (Ph

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the USC ACT, 19

BSc (Physics) and B.Tech.(DS&AI)

## **Text Books:**

1. Kolman Bernard, Robert Busby, Sharon Ross and Nadeemur Rehman, Discrete Mathematical Structures, PHI, 5th Edition, 2006.

## Reference Books:

- 1. Liu.C.L, and D.P.Mohapatra, Elements of Discrete Mathematics,a Computer Oriented Approach, Tata McGraw Hill, 4th edition, 2013.
- 2. Gary Haggard and John Schlipf, Discrete Mathematics for Computer Science, Thomson 2006.
- 3. Mott.J.L, Kandel.A, Baker.T.P, Discrete Mathematics for Computer Scientists and Mathematicians, PHI 2006.
- 4. Rosen.K.H, Discrete Mathematics and its Applications, TMH,2011

# **Course Outcomes:**

Upon successful completion of the course, student will be able to:

- use logical notation to determine if an argument is valid
- write and evaluate a proof
- Use graph theory in optimal circuit design
- understand the basics of Boolean Algebra and Lattices
- design and analyse algorithms
- analyse phrase structure grammars for languages
- develop error-correcting codes
- apply Number Theory in cryptography for computer security

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-Universed Under Section 3 of the UG)

Street (DS&AI)

FOR H

Course No: DS221	Course Title: Data Structures	L	P	U
Course No: DS221	Course Title: Data Structures	2	2	3

- To understand the basics of all data structures.
- To choose the appropriate data structure for specific application.
- To understand and analyze various searching and sorting algorithms.
- To solve the complex problem using hashing, trees and graph.
- To implement various algorithms and data structures using C and to improve the programming skills.

#### **Course Contents**

#### **UNIT-I**

Introduction to Data Structures, need and advantages of data structure. Array, Pointers: basics, pointer with function, array of pointers, pointer to array, applications, advantages and disadvantages of pointer. Linear data structures: Stack, Queue, Linked list. Stack: Fundamentals, stack implementation using array and linked list, infix to postfix conversion and vice versa, postfix expression evaluation, recursion, stack operations: Traversing, insertion, deletion, searching (linear search and binary search), sorting (insertion sort, selection sort, bubble sort, quick sort, merge sort)

## .UNIT-II

Queue: Fundamentals, queue implementation using array and linked list. Queue operations: traversing, insertion and deletion. Double ended queue: Basics, implementation, operations. Circular queue: Basics, implementation, operations. Application of queue.

## **UNIT-III**

Linked list: Fundamentals, difference between array and linked list. Single linked list: basics, representation, operations: insertion, deletion, traversing. Double linked list: basics, representation, operations: insertion, deletion, traversing. Circular linked list: basics, representation, operations: insertion, deletion, traversing.

#### **UNIT-IV**

Tree: Fundamentals, representation. Binary tree: Basics, representation, complete binary tree, tree, traversal: Inorder, preorder, postorder traversal, searching, sorting (heap sort, radix sort). Binary search tree: Basic, Inorder, preorder, postorder traversal, searching, sorting (heap sort, radix sort). B+ tree: Basic, traversing, searching, sorting. Red-black tree: Basic, traversing, searching, sorting. AVL tree: traversing, searching, sorting. Threaded binary tree: Basic, traversing, searching, sorting.

## **UNIT-V**

Graph: Basics, Representation: adjacency matrix. Cyclic graph: basics, Acyclic graph: Basics, Traversal: Depth first search, Breadth first search. Minimum spanning tree, shortest path (Dijkstra algorithm), Prim's algorithm. Hashing.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)



# **Text Books:**

- 1. Fundamentals of Data structures in C, E. Horowitz, S. Sahni and Susan Anderson-Freed, Universities Press., 2nd Edition, 2007.
- 2. Data Structures, S. Lipscutz, Schaum's Outlines, TMH.McGraw Hill Education; 1st edition, July 2017.

## **Reference Books:**

- 1. Data structures: A Pseudo code Approach with C, R. F. Gilberg and B. A. Forouzan, Cengage Learning, 2nd edition, November 2007.
- 2. Data structures A Programming Approach with C, D. S. Kushwaha and A.K. Misra, PHI.Phi Learning pvt Ltd, 1<sup>st</sup> edition, February 10, 2011.

# **List of Data Structures Laboratory Experiments:**

S.No	Experiment / Program Name	Duration
1,	Implementing Stack using Array	1:40 H
2.	Implementing Queue using Array	1:40 H
3.	Solving an Arithmetic Expression using Stack	1:40 H
4.	Implementing Various Sorting Techniques - Bubble / index / radix / quick sort	1:40 H
5.	Implementing Single Linked List - Insertion / Deletion / Searching	1:40 H
6.	Implementing Doubly linked List - Insertion / Deletion / Searching	1:40 H
7.	Implementing Binary Tree Traversals - Inorder / Preorder / Postorder	1:40 H
8.	Implementing Binary Search Tree - Insertion / Deletion / Searching	1:40 H
9.	Implementing Depth First Search	1:40 H
10.	Implementing Breadth First Search	1:40 H
11,	Implementing Kruskal's Algorithm - Minimum Cost Spanning Tree	1:40 H
12.	Implementing Prim's Algorithm - Minimum Cost Spanning Tree	1:40 H

IcfaiTech - CURRICULUM&SYLL BUS, IFHE, Hyderabor B. Physics) and B. Tech. (DS&AI)

REGISTRAR

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed+to-be-University Under Section 3 of the UGC ACT, 1956)

# **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Understand how to use data structure concepts for realistic problems.
- Ability to identify appropriate data structure for solving computing problems in respective language.
- Ability to solve problems independently and think critically.
- Utilize the acquired skill sets and solve problems using the appropriate data structures.

IcfaiTech - CURRICULUM&SVIJIABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR DIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UG

B.Sc (Physics) and B.Tech.(DS&AI)

FOR HIGH

Course No: DS311	Course Title: Artificial Intelligence	L	P	U
Course No: DS311		3	0	3

- To explain basic concepts of machine learning and classical AI
- To compare advantages and disadvantages of some basic AI algorithms
- To choose appropriate algorithms for solving given AI problems in a memory- and time-efficient manner.
- To implement efficient AI algorithms in a suitable programming language.
- To analyze and critically discuss soft aspects of AI.

#### **Course Contents**

## **UNIT-I**

Definitions of Artificial Intelligence, Different Perspectives, Historical background. Understanding those elements constituting problems and learning to solve it by various uninformed and informed (heuristics based) searching techniques.

## **UNIT-II**

To understand those formal methods for representing the knowledge and the process of inference to derive new representations of the knowledge to deduce what to do

#### **UNIT-III**

To understand the notion of planning in AI and some techniques in the classical planning system

# **UNIT-IV**

To understand the notion of uncertainty and some of probabilistic reasoning methods to deduce inferences under uncertainty

## UNIT- V

To understand some of those mechanisms by which an AI system can improve it's behavior through its experience. Approaches to machine learning, AI-prospects, and dangers Ethical and Philosophical issues.

## **Text Books:**

1. Artificial Intelligence A Modern Approach, by Stuart Russell and Peter Norvig, 3<sup>rd</sup> Edition, Pearson Education, 2010, ISBN 13:978-0-13-604259-4.

ON FOR HIG

HYDERABAT

THE ICEAL FOUNDALISM FOR HIGH

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

## **Reference Books:**

- 1. Artificial Intelligence, structures and strategies for complex problem solving, by George F. Luger, 6<sup>th</sup> Edition, Pearson Education, 2008 ISBN-10:0321545893.
- 2. Artificial Intelligence Illuminated, by Ben Coppin, Jones and Bartlett, 2<sup>nd</sup> Edition, 2001, ISBN-13:978-0763732301

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- give an overview of the field of artificial intelligence, its background, history, fundamental issues, challenges and main directions
- explain basic concepts, methods and theories for search account for classical planning of proactive agents
- describe methods and theories for reactive agents, architectures based on subsumption, and potential fields
- explain concepts, methods and theories of embodied cognition and situatedness and theories of sensing
- explain basic concepts, methods and theories of artificial evolution, genetic algorithms, multiple autonomous agents and swarm intelligence

1301 FIA DOUGHT IN

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Decembed to be University Under Section 3 of the UGC ACT, 1)

Course No: CS312	Covers Titles On existing Systems	L	P	U
Course No: CS312	Course Title: Operating Systems	3	2	4

- To provide a clear understanding of the concepts that underlies operating systems.
- To discuss Process Management and Concurrency control.
- To discuss memory management and virtual memory techniques.
- To introduce the practical aspects that pertain to the most popular operating systems such as Unix/Linux and Windows.
- To improve the programming skills of the students by implementing various operating system principles using C/C++/Java/Python.

#### **Course Content**

#### UNIT- I

Introduction to Operating System: Operating Systems Objectives and functions, Computer System Architecture, OS operations, Different types of O.S: batch, multi-programmed, timesharing, real-time, distributed, parallel. Operating System services, System Calls and Types of System Calls, Operating System Structure, Virtual Machines.

#### **UNIT-II**

Process Management: The Process, Process States, Process Control Block(PCB), Process Scheduling, Operations on process, Inter Process Communication(IPC), Examples of IPC on Unix Operating System Thread Management: Overview of Thread, Advantages of Multithreaded Programming, Thread libraries on Unix Operating System CPU scheduling: Basic Concepts, Scheduling criteria, Scheduling Algorithms and Thread Scheduling.

## **UNIT-III**

Concurrency: Principles of Concurrency ,Mutual Exclusion ,Critical Section Problems, Peterson's Solution, Semaphores, Classic Problems of Synchronization ,Monitors Deadlocks: Deadlock, Deadlock Characterization ,Methods to Handle deadlocks, Deadlock prevention, Detection and Recovery Techniques Memory Management: Background, Swapping ,Memory Management Algorithms ,paging ,Structure of Page Table , Segmentation.

## **UNIT-IV**

Virtual Memory Management: Introduction to Virtual Memory , Demand paging ,Page Replacement Algorithms ,Allocation of Frames and Thrashing , Case studies on Unix and Windows File System: File Concept, Access Methods ,Directory and Disk Structure ,File System Mounting ,File Sharing and File Protection Implementing File System: File System Structure, File System Implementation, Directory Implementation, Allocation Methods ,Free Space Management and Efficiency and Performance .

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

B.Sc (Brysics) and B.Tech.(DS&AI)

FOR HI

/ JA Milliam lo Entra Jahr

LIGEAL FITZ DELLE FOR HIGHER EDUCATION

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

## **UNIT-V**

Secondary Storage Structure: Mass-Storage Structure, Disk Scheduling ,Swap Space management , RAID Structures System Protection: Goals of Protection, Principles of Protection ,Domain of Protection, Access Matrix, Operation of Access Matrix, Revocation of Access rights ,Capability Based Protection System Security: The Security Problem, Program Threads , System and Network Threads, Cryptography, Firewalls to Protect Systems and Networks case study: The Linux System.

## **Text Books**

1. Abraham Silberschatz, Peter B.Glavin, Greg Gagne, "Operating System Concepts", Wiley Publication, 8<sup>Th</sup> Edition,2011

## Reference Books

- 1. D.M.Dhamdhere,"Operating System A concept based approach", Tata Mcgraw-Hill, 2<sup>nd</sup> Edition.
- 2. Andrew S Tanenbaum, "Operating System Design and Implementation", 3/E, Prentice Hall.
- 3. Achyut S Godbole, "Operating System", Tata Mcgraw Hill, 2nd Edition.
- 4. Maurice J. Bach,"The design of Unix Operating System", Prentice Hall.1986,1st edition
- 5. W .Richard Stevens "Advanced Programming in the Unix Environment", 2015, 3<sup>rd</sup> edition.

## **List of Operating Systems Laboratory Experiments:**

No.s	Name of the Experiment	Duration
1	Shell Scripting in Linux / Unix Environment	1: 40H
2	Implementing a Simple Client and Server using socket programming in C/C++	1: 40H
3	Implementing a Server and Client to transfer the requested file from the server to the client using socket programming in C/C++	1: 40H
4	Implementing a micro shell using C/C++, which implements the linux/unix commands – ls, mkdir, exit and clear	1: 40H
5	Implementing a micro shell using C/C++, which implements the linux/unix commands – ls -l, cd, rmdir, history.	1: 40H
6	Given the list of processes, their CPU burst times and arrival times. Compute and print the average waiting time and average turnaround time for FCFS and SJF	1: 40H
7	Given the list of processes, their CPU burst times and arrival times.	1: 40H

IcfaiTech - CURRICULUM&SVI ABUS, IFHE, Hyderabad

3.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to-be-University Under Section 3 of the UGC ACT, 1956)

	Compute and print the average waiting time and average turnaround time for Priority and Round Robin Scheduling	
8	Developing Application using Inter Process communication (using shared memory, pipes or message queues).	
9	Implement the Producer – Consumer problem using semaphores (using UNIX system calls).	1: 40H

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Gain extensive knowledge on principles and difference between different types of modern operating systems, virtual machines and their structure of implementation.
- Understand process management, concurrent processes and threads
- Compare performance of processor scheduling algorithms.
- Able to understand the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.
- Produce algorithmic solutions to process synchronization problems.
- Able to understand the types of I/O management; disk scheduling, protection and security problems faced by operating systems and how to minimize these problems

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

B.S. (P)(ysics) and B.Tech.(DS&AI)

O N DC212	Community Indian Indian to Data Science	L	P	U
Course No: DS313	Course Title: Introduction to Data Science	3	0	3

- To know how to select, calculate, and report the suitable descriptive & visual statistics for a research problem.
- To understand the probability, hypothesis testing, and sampling.
- To know the current future analysis using parametric and non-parametric test
- To familiar with the multiple regression and logistic regression and DBMS.
- To experience the way of understanding the structure of data and extraction

#### **Course Contents**

## **UNIT-I**

Exploratory Data Analysis (EDA): Different types of data, Summary Analytics (Descriptive Statistics): Central Tendency, Dispersions, Five number, Distributions, Cross Tabulations. Visual, Analytics: Histogram, Box Plot, Correlation Plot, Scatter Plot, Line Chart, Bar Chart, Pie Chart, Bubble Chart, Decision Tree, Cluster Charts.

## **UNIT-II**

Hypothesis Testing: Confidence Intervals, Hypothesis Testing: Constructing a hypothesis, Null Hypothesis & Alternative Hypothesis, Type I and Type II errors, Power Value, Parametric test: Z test, One Sample T-TEST, Paired T-TEST, Independent Sample T-TEST, ANOVA, MANOVA, Level of significance, Power of a test. Non parametric test: Chi Square Test, Fisher's Test, Mann-Whitney U test, Kruskal-Wallis Rank Test, Wilcoxon sign rank.

# **UNIT-III**

Regression Analysis: SLR Regression: Coefficient of determination, Significance, tests for predictor variables, Residual analysis, AutoCorrelation, Homoscedasticity, Multicollinearity, MAPR, VIF Analysis, Durbin Watson, AIC, BIC, Stepwise regression, Forward Regression, Backward Regression, Quadrant Regression, Transformed Regression and Dummy Regression, Multiple linear regression and Odd ratio.

## **UNIT-III**

Classification: Logistic Regression, Discriminate Regression Analysis, Test of Associations, Chi-square strength of association, Maximum likelihood estimation, Confusion matrix (Model fit parameters), Support Vector Machines (SVM), Naive Bayes, Random Forests: Bagging & Boosting, CHAID Analysis, Decision trees, k-Nearest Neighbors, Neural Network.

## **UNIT-V:**

Unsupervised Learning: Principal component analysis, Reliability Test, KMO tests, EigenValue Interpretation, Rotation and Extraction steps, Conformity Factor Analysis, Exploratory Factor Analysis, K Means clustering, Agglomerative Clustering. Introduction to DBMS: ER Modeling, Functional Dependencies, Normalization, DDLs, DMLs, Views, OLTP, Database Integrity, Concurrency.

## **Text Books:**

1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services Wiley

IcfaiTech - CURRICULUM&S JABUS, IFHE, Hyderabad B.Schhysics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemedto-be-University Under Section 3 of the UGC ACT, 1956)

2. Statistics for Managers Using Microsoft Excel, 8th Edition, by David M. Levine, David F. Stephan, and Kathryn A. Szabat, Publisher: Pearson.

## **Reference Books:**

1. Data Mining in excel: Lecture Notes and cases by GalitShmueli, Publisher: Wiley

List of Introduction to Data Science LAB Experiments

S.No	Experiment	Duration
1	Introduction to fundamentals of R studio and Python for data science	2Hr
2	Basic Statistics and Visualization in R	1.3Hr
3	Implementation of data following algorithms for analyzing the data.: K-means Clustering	1Hr
4	Implementation of data following algorithms for analyzing the data.: Association Rules	1Hr
5	Implementation of data following algorithms for analyzing the data.: Linear Regression	1Hr
6	Implementation of data following algorithms for analyzing the data: Logistic Regression	1Hr
7	Implementation of data following algorithms for analyzing the data.: Naive Bayesian Classifier	1.2Hr
8	Implementation of data following algorithms for analyzing the data.:  Decision Trees	1Hr
9	Implementation of data following algorithms for analyzing the data.: Simulate Principal component analysis	1.10Hr
10	Implementation of data following algorithms for analyzing the data.: Simulate Singular Value Decomposition	1.2Hr

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Summarize the data using visual & summary analytics and common probability distributions
- Make inference about a sample & population using hypothesis test.
- Fit, interpret, and assess regression models and classification with one or more predictors.

FOR HIG

HYDERABA

• Able to implement distinct algorithms in R or Python.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

Sovenysics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

aurea Nas DC214	Course Title: DATA WAREHOUSING AND	L	P	U
ourse No: DS314	MINING	3	0	3

1. To introduce the fundamental concepts of data mining.

2. To study data mining tasks of classification, clustering, and finding association rules and be introduced to their algorithmic aspects of the three main data mining tasks, and their typical application domains & case studies.

3. To introduce the components, and processes of a Data Warehouse, the architecture of a data warehouse, and collection of business requirements for a data warehouse

4. To learn dimensional modeling for designing database schemas for a Data Warehouse To understand the role of Data Marts & ODS in Data Warehousing .To be introduced to advanced Dimensional Modeling concepts

5. To understand the ETL process and to be introduced to OLAP, and the idea of multidimensional databases

#### **Course Contents**

## **UNIT-I** -Introduction

Introduction to Big Data and the relevance of data mining. Learning what tasks constitute data mining. Real-world data mining applications. Relation to Business Intelligence techniques and predictive modeling. Real-world data mining applications, Data and Preprocessing, Understanding of Data, what is data? Types of attributes, properties of attribute values, types of data, data quality, Sampling, Data Normalization, Data Cleaning, Similarity Measures, Feature Selection/Instance Selection, the importance of feature selection/instance selection in various big data scenarios.

Case Study: Balance the Dataset (Preprocessing), Apply the Normalization technique for varying scale data (Normalization), Review rating dataset (Similarity Measures)

#### **UNIT-II-Classification**

Introduction to various classification techniques -Decision-Trees Rule-based, Instance-based classifiers like k-Nearest Neighbors, Support Vector Machines (SVMs), Ensemble Learning, Classification Model, Selection and Evaluation. Application-B2B customer buying stage prediction, Recommender Systems The algorithmic and statistical aspects of the techniques.

Case Study: Play or not Play using Weather dataset (Decision Tree), Predicting heart disease or not Using heart disease dataset (SVM), Predicting diabetes using PimaIndians Diabetes (KNN)

## **UNIT-III**

Clustering and Association Analysis: Clustering- introduction to partitional and hierarchical clustering methods, graph-based methods, density-based methods Applications- customer profiling, market segmentation. Association Analysis Apricai algorithm and its extensions, Association Pattern Evaluation, Sequential Patterns and Evaluation Subgraph Mining Applications- B2B Customer Buying Path Analysis, Medical Informatics, Telecommunication

IcfaiTech - CURRICULUMAS J. LABUS, IFHE, Hyderabad

Physics) and B.Tech.(DS&AI)

THE ICEAL FOR MONTH OR HIGHER EQUICATION

alarm diagnosis. The algorithmic and statistical aspects of the techniques to be covered as deemed necessary, in order to present the discussion of relevant applications

Case Study: Group the medicine ( Clustering), Find the pattern using transaction dataset (Apriori algorithm)

#### **UNIT-IV**

Data Warehouse Components, Processes and Architecture: Source Systems, Data Staging Area, Presentation Server, Data Marts, Operational Data Store (ODS), Metadata, Information Delivery, Basic Processes of a Data Warehouse, Architecture, Collecting Business Requirements, Data Marts and ODS=Architecture, Design and Cost. Advanced Dimensional Modeling Concepts like Surrogate Keys, Changing Dimensions, Conformed Dimensions, Fact less Fact Tables, Mini Dimensions and, Role playing Dimensions, Multivalued Dimension

## UNIT- V

Extraction, Transformation, & Loading (ETL): Data Extraction, Data Transformation, Data Loading, ETL Data Structure, ETL Tools. Introduction to Online Analytical Processing (OLAP)Need for OLAP, Features & Functions, ROLAP, MOLAP, HOLAP, & DOLAP,OLAP Implementation ,SQL Features for DW-CUBE Operator, Roll-up Operator, Top-N Queries, Window Queries Metadata, and a Suitable Data Warehousing Case Study

#### **Text Books:**

1. Tan P. N., Steinbach M & Kumar V. "Introduction to Data Mining" Pearson Education, 2006

#### **Reference Books:**

- 1. Han J & Kamber M, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, Second Edition, 2006.
- 2. Zaki MJ & Wagner M JR, "Data Mining and Analysis-Fundamental Concepts and Algorithms" Cameridge Univ Press, 2014.
- 3. Dunhum M.H. & Sridhar S. "Data Mining-Introductory and Advanced Topics", Pearson Education, 2006.
- 4. Arun K. Pujari, "Data Mining Techniques", Universities Press, 2001

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Approach business problems data-analytically.
- Think carefully & systematically about whether & how data can improve business performance, to make better-informed decisions for management, finance, marketing and some other business activities that lead to employability opportunities.
- Interact competently on the topic of data mining for business intelligence. Know the basics of data mining processes, algorithms, & systems well enough to interact with data mining experts, consultants, etc.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderathar DERABAD B \$c (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION TO THE ICFAI FOUNDATION FOR HIGHER EDUCATION TO THE USC ACT, 1956.

Commo No. DC221	Course Titler Machine Learning	L	P	U
Course No: DS321	Course Title: : Machine Learning	3	2	4

- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To understand the basic theory underlying machine learning.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.
- To be able to read current research papers and understands the issues raised by current research
- To be able to implement machine learning algorithms and retrieve the required data.

#### UNIT - 1

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find-S, Version spaces and the candidate elimination algorithms, Remarks on candidate elimination algorithms

Case Study: Consider the checkers learning problem, design a solution that can improve the performance of the Checkers game.

#### **UNIT-II**

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning Artificial Neural Networks – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition, Advanced topics in artificial neural networks

Case Study: Apply the decision tree for identifying the best rated movies from Movie dataset.

## UNIT - III

Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

cfaiTech - CURRICULIMESYLLABUS, IFHE, HE

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the U6C ACT, 1956

15/ B

B<sub>3</sub>Sc (Physics) and B.Tech.(DS&AI)

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm

Case study: Apply the Naive Bayes for predicting the severity of cancer from Cancer Dataset.

#### **UNIT-IV**

Computational learning theory – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning - Instance-Based Learning-Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning

Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms Learning Sets of Rules – Introduction, Sequential Covering Algorithms,

Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules: FOIL, Induction as Inverted Deduction, Inverting Resolution

Analytical Learning - Introduction, Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge

Case Study: Apply the k-NN on pima-indians-diabetes dataset and identify the youngest person suffering from diabetic.

## UNIT - V

Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators, Reinforcement Learning – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship toDynamic Programming

## **TEXT BOOKS:**

- 1. Machine Learning Tom M. Mitchell, McGraw Hill Education; First edition, 2017.
- 2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Chapman and Hall/CRC; 2<sup>nd</sup> Edition, 2014.

#### **REFERENCE BOOKS:**

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William WHsieh, Cambridge University Press; Reprint edition 2018.

HYDERABAT

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

- 2. Pattern Classification, Richard O. Duda, Wiley-Blackwell; 2nd Edition, 2004.
- 3. Neural Networks for Pattern Recognition, Christopher M. Bishop, Clarendon Press, 1<sup>st</sup> Edition, 1995.
- 4. Machine Learning South Asia Edition: The Art And Science Of Algorithms That Make Sense Of Data, Peter Flach, Cambridge University Press, 1st Edition, 2015.

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
- Have an understanding of the strengths and weaknesses of many popular machine learning approaches.
- Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.
- Be able to design and implement various machine learning algorithms in a range of real-world applications.
- Can implement machine learning algorithms and retrieve the required data.

IcfaiTech - CURRICUL HASYLLABUS, IFHE, Hyderand S.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

Course No: DS32	Course Titles Even ant Systems	L	P	U
Course No. DS52	Course Title: Expert Systems	3	0	3

- Describe the concepts central to the creation of expert systems.
- Illustrate the tools and the processes used for the creation of an expert system.
- Demonstrate methods used to evaluate the performance of an expert system.
- Conduct an in-depth examination of existing expert systems.
- Describe the program structure of LISP and PROLOG.
- Few Case studies were carried out on Expert Systems and Knowledge Representation.

#### UNIT-I

Introduction: Expert systems and AI, Separating knowledge and inference, Logic and Resolution: Propositional logic, First-order predicate logic, reasoning in logic: inference rules, Resolution and first-order predicate logic, Resolution strategies, applying logic for building expert systems, Logic as a representation formalism.

#### UNIT-II

Production Rules and Inference: Knowledge representation in a production system, Inference in a production system, Pattern recognition and production rules, Production rules as a representation formalism. Frames and Inheritance: Semantic Nets, Frames and single inheritance, Frames and multiple inheritance, Frames as a representation formalism.

## **UNIT-III**

## Reasoning with Uncertainty:

Production rules, inference and uncertainty, Probability theory, the subjective Bayesian method, the certainty factor model, The Dempster-Shafer theory, Network models. Tools for Knowledge and Inference Inspection: User interface and explanation, A user interface in PROLOG, Rule models. Case Study: A Course Advisor Expert System

#### **UNIT-IV**

OPS5: Knowledge representation in OPS5, the OPS5 interpreter, the rete algorithm. CENTAUR: Limitations of production rules, Prototypes, Pages, Reasoning in CENTAUR.

A Case Study of Knowledge Kepresentation in LE CYDERABAN

\* NB.Sc (Physics) and B.Tech.(DS&AI) IcfaiTech - CURRICULL M&SYLLABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

#### **UNIT-V**

Introduction to PROLOG: Logic programming, Programming in PROLOG, the declarative semantics, the procedural semantics and the interpreter, Overview of the PROLOG language, Arithmetical predicates, Examining instantiations, Manipulation of the database.

#### **Introduction to LISP:**

Fundamental principles of LISP, the LISP expression, Procedural abstraction in LISP, Overview of the language LISP, Symbol manipulation, Predicates, Control structures, the lambda expression, Enforcing evaluation by the LISP interpreter. Paradigms of Artificial Intelligence Programming: Case Studies in Common Lisp.

#### Text Book:

1.Principles of Expert Systems Peter J.F. Lucas & Linda C. van der Gaag, Addison-Wesley, 1<sup>st</sup> Edition, 1991.

## References:

- 1. Introduction to Expert Systems, Jackson P., 3rd edition, Addison Wesley, 1998.
- 2. Giarratano J., Riley G., Expert Systems, Principles and Programming, Course Technology; 4<sup>th</sup>edition, 2004.
- 3. Introduction to Knowledge Systems, Stefik M., Morgan Kaufmann, 1st Edition, 1995.

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Define and describe the expert system and its main constituents.
- Distinguish class of problems suitable for solving with expert systems.
- Breakdown the problem and select crucial parts.
- Assemble various parts of knowledge and skills in order to devise the approach to solution.
- Design and create an expert system suitable for solving particular problems.
- Appraise the quality of solution and justify the employed techniques.
- To meet the industry needs with help of a few case studies discussed and practiced technologies.

IcfaiTech - CURRICULUMANTILLABUS, IFHE, Hyd

THE ICFAI FOUNDATION FOR HIGHER EDITION Of the ITEM CONTROL OF THE

Commo No. CC222	Course Title Commuter Networks	L	P	U
Course No: CS323	Course Title: Computer Networks	3	0	3

- Build an understanding of the fundamental concepts of data communication and computer networking
- To study the foundational principles, architectures, and techniques employed in computer networks.
- To study the concepts of communication networks, protocols and their performance
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks
- To study TCP & UDP socket and RIP, OSPF routing protocols

## **Course Contents**

#### UNIT-I

Uses of Computer Networks, Network Hardware, Network Software, Network protocol (syntax, semantics, and timing); Protocol suites (OSI and TCP/IP); Layered protocol software (stacks): Physical layer networking concepts; data link layer concepts; network layer concepts; transport and application layer concepts; Network Standards and standardization bodies.

#### **UNIT-II**

Bandwidth and Data Rate, Encoding and Modulation Techniques, Transmission modes, Multiplexing (FDM &TDM), Transmission media.

# **UNIT-III**

LAN topologies (bus, ring, star), LAN technologies (Ethernet, token Ring, Gigabit Ethernet), Error detection and correction, Carrier sense multiple access networks (CSMA), Large networks and wide areas, Protocols (addressing, congestion control, virtual circuits, quality of service). Internet - addressing, routing, end point control; Internet protocols - IP, TCP, UDP, ICMP, HTTP, CIDR

## **UNIT-IV**

Flooding; Minimal spanning trees; Bellman Ford, Dijkstra's, OSPF, BGP shortest path algorithms; The leaky bucket, floydwarshall and Random Early Detection congestion methods; Data security and integrity: Fundamentals of secure networks; cryptography; Encryption and privacy: Public key, private key, symmetric key; Authentication protocols; Packet filtering; Firewalls; Virtual private networks; Transport layer security

IcfaiTech - CURRICULUM&SYLLABUS, IMME, Hyderaliad B. C. Physics) and B. Tech. (DS&AI)

FOR HIG

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

## **UNIT-V**

Overview of the issues of network management; Domain names and name services; Issues for Internet service providers (ISPs); Quality of service issues: performance, failure recovery.

## **Text Books**

- 1. W. Stallings, "Data & Computer Communications", Prentice-Hall, 10th Edition, 2005.
- 2. A. S. Tanenbaum, "Computer networks", Prentice-Hall, 5th Edition, 2005

#### Reference Books

- 1. Behrouz A Forouzan, "Data Communications and Networking", Tata Mc-grawhill, 2<sup>nd</sup> Edition, 2007.
- 2. J.F.Kurose and K.W.Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education, 6<sup>th</sup> Edition, 2001.

List of Computer Networks Laboratory Experiments:

SNo	Experiments	Duration
1	Write a program to implement Connection oriented Client & Server (TCP Client & TCP Server)	1.40H
2	Write a program to implement Connection less Client & Server (UDP Client & UDP Server)	1.40H
3	Time of the day server and client using TCP	1.40H
4	Concurrent echo server & client using UDP	1.40H
5	How to configure Ethernet , Telnet and Console interface on CISCO router using Netsimk and CISCO Packet Tracer	1.40H
6	How to configure LAN & WAN interfaces on CISCO router	1.40H
7	How to configure static routing	1.40H
8	How to configure RIP, OSPF, EIGRP protocols on CISCO router	1.40H
9	How to configure L2 & L3 switches	1.40H

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- understand basic computer network technology
- Understand and explain Data Communications System and its components
- Identify the different types of network topologies and protocols
- Understand about working of Intranet, LAN, WAN, MAN setups, different topologies
- Gain familiarity with common networking protocols and algorithms
- Configure network protocols and analyze its performance
- Understand, configure troubleshoot routing protocols using simulators like netsimk and CISCO packet track

(Physics) and B.Tech.(DS&AI) IcfaiTech - CURRICULUM&SYI BUS, IFHE, Hyderabad

REGISTRAR THE ICFAI FOUNDATION FOR HIGHER FEET

(Deemed to be Univers to Section 3 of the

Course No:	Course Title Newal Networks and Fuggy Logic	L	P	U
DS324	Course Title: Neural Networks and Fuzzy Logic	3	0	3

- To impact knowledge on fuzzy logic principles
- To understand models of ANN
- To use the fuzzy logic and neural network for application related to design and manufacture

#### **UNIT-I**

ARCHITECTURES: Introduction —Biological neuron-Artificial neuron-Neuron modeling-Learning rules-Single layer-Multi layer feed forward network-Back propagation-Learning factors.

#### UNIT-II

NEURAL NETWORKS FOR CONTROL: Feedback networks-Discrete time hop field networks-Schemes of neuro –control, identification and control of dynamical systems-case studies (Inverted Pendulum, Articulation Control).

Case study: Application of fuzzy logic and neural networks to Measurement-Control- Adaptive Neural Controllers – Signal Processing and Image Processing.

## **UNIT-III**

FUZZY SYSTEMS: Classical sets-Fuzzy sets-Fuzzy relations-Fuzzification — Defuzzification- Fuzzy rules.

## **UNIT-IV**

FUZZY LOGIC CONTROL: Membership function – Knowledge base-Decision –making logic –Optimizations of membership function using neural networks-Adaptive fuzzy systems-Introduction to generate to genetic algorithm.

Case study: Fuzzy logic control-Inverted pendulum -Home Heating System-Blood pressure during anesthesia.

## **UNIT-V**

APPLICATION OF FLC: Fuzzy locic control-Inverted pendulum-Image processing-Home Heating system-Blood pressure puring anesthesia-Introduction to neurofuzzy controller.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the University University Under Section 3 of the University University Under Section 3 of the University Universit

## TEXT BOOKS:

- 1. Kosko, B, "Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence", PrenticeHall, NewDelhi, 2nd Edition, 2004.
- 2. Timothy J Ross, "Fuzzy Logic with Engineering Applications", John Willey and Sons, West Sussex, England, 2<sup>nd</sup> Edition, 2005.

#### **REFERENCE BOOKS:**

- 1. Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co., Boston, 2002.
- 2. Klir G.J. &Folger T.A., "Fuzzy sets, Uncertainty and Information", Prentice –Hall of India Pvt. Ltd., New Delhi, 2008.
- 3. Zimmerman H.J., "Fuzzy set theory and its Applications", Kluwer Academic Publishers Dordrecht, 2001.
- 4. Driankov, Hellendroonb, "Introduction to fuzzy control", Narosa Publishers, 2001.
- 5. Laurance Fausett, Englewood cliffs, N.J., "Fundamentals of Neural Networks", P
- 6. Rajasekaran, S. Vijayalakshmi Pai. G.A. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice Hall of India Private Limited, 2003

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- To Expose the students to the concepts of feed forward neural networks
- To provide adequate knowledge about feedback networks.
- To teach about the concept of fuzziness involved in various systems and to provide adequate knowledge about fuzzy set theory.
- To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
- To provide adequate knowledge of application of fuzzy logic control to real time systems.

ABUS, IFHE, Hyderabad Mhysics) and B.Tech.(DS&AI) REGISTRAR

OR HIGH

THE ICFAI FOUNDATION FOR HIGHER TO ALL

Deemed to be University Made: Section 3 of the

Cannas No. DC401	Corres Title Predictive Amelytics	L	P	U
Course No: DS401	Course Title: Predictive Analytics	3	0	3

- Gain understanding of the computational foundations in Big Data Science.
- Develop critical inferential thinking.
- Gather a tool chest of R libraries for managing and interrogating raw and derived, observed, experimental, and simulated big healthcare datasets.
- Possess practical skills for handling complex datasets.

## Unit – I

Introduction to Predictive Analytics & Linear Regression (NOS 2101): What and Why Analytics, Introduction to Tools and Environment, Application of Modelling in Business, Databases & Types of data and variables, Data Modelling Techniques, Missing imputations etc. Need for Business Modelling. Regression — Concepts, Blue property-assumptions-Least Square Estimation. Variable Rationalization, and Model Building etc.

Case study: Take any three data modeling techniques and implement them on a real time system.

## Unit - II

Logistic Regression (NOS 2101): Model Theory, Model fit Statistics, Model Conclusion, Analytics applications to various Business Domains etc. Regression Vs Segmentation — Supervised and Unsupervised Learning, Tree Building — Regression, Classification, Overfitting, Pruning and complexity. Multiple Decision Trees etc.

Case study: Predict the best share to buy from a stock mart dataset using Logistic regression algorithm.

## Unit - III

Objective Segmentation (NOS 2101): Regression Vs Segmentation — supervised and Unsupervised Learning, Tree Building — Regression, Classification, Overfitting, Pruning and complexity, Multiple Decision Trees etc. Develop Knowledge, Skill and Competences (NOS 9005) Introduction to Knowledge skills & competencies, Training & Development, Learning & Development, Policies and Record keeping, etc.

Case study: Design a blueprint/system that have all phases of training the employees and developing the product

#### Unit - IV

Time Series Methods I Forecasting, Feature Extraction (NOS 2101): Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average, Energy etc and Analyze for prediction. Project

Case study: Predict the winning chances of a politician by analyzing the social media data using the ARIMA model.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad (B.Sc. Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Dearned-to-be-University Under Section 3 of the UGC ACT, 1956)

## Unit - V

Understanding Map Reduce Fundamentals and HBase: The MapReduce Framework; Techniques to Optimize MapReduce Jobs; Uses of MapReduce; Role of HBase in Big Data Processing; Storing Data in Hadoop: Introduction of HDFS, Architecture, HDFC Files, File system types, commands, org.apache.hadoop.io package, HDF, HDFS High Availability; Introducing HBase, Architecture, Storing Big Data with HBase, Interacting with the Hadoop Ecosystem; HBase in Operations Programming with HBase; Installation, Combining HBase and HDFS:

#### TEXT BOOK

- 1. BIG DATA and ANALYTICS, Seema Acharya, Subhasinin Chellappan, Wiley publications, 1<sup>st</sup> Edition, 2015.
- 2. Student's Handbook for Associate Analytics-III, Nasscom, 2<sup>nd</sup> Edition, 2014.

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Experiment with various techniques of predictive analytics and work on missing Data.
- Identify suitable data models for Logistic Regression.
- Compare regression and segmentation using Sigmoidal function.
- Build decision trees for classification and prune for accuracy.
- Analyze integrated processes for univariate stationary and non- stationary data.
- Define purpose, scope and format of project documentation.
- Can predict the data/information from the dataset using machine learning algorithms

IcfaiTech - CURRICULUMESY LABUS, IFHE Hyderabad REGISTRAR THE ICFAI FOUNDATION FOR HIGHER EDUC

(Deemed to be University Under Section 3 of the USC ACT, 1956

C N DC402	Course Titles System for Data Analytics	L	P	U
Course No: DS402	Course Title: System for Data Analytics	3	0	3

- To understand the various aspects of the computational infrastructure used for processing big data
- To understand the different types of computer architectures and how they influence the processing of data. The manner in which task parallelism and data parallelism interact with data processing
- To understand distributed and parallel database systems
- To understand the various processing frameworks, like batch processing, map-reduce, and stream processing
- To understand the fundamentals of cloud computing from the point of view of processing frameworks
- To become with platforms like AWS and Azure

#### Unit I

Introduction to data engineering – to appreciate the difference between data engineering and data science. To understand the data processing activities like partitioning, replication, grouping and sorting, and data locality

#### Unit II

A brief study of various computer architectures, Flynn's taxonomy. To understand task parallelism and data parallelism

#### **Unit III**

To study parallel and distributed databases. Their architecture and performance. The architecture of parallel databases – shared memory, shared disk, and shared-nothing. Pipeline and partitioned parallelism. Speed and scale. Partitioning of data. Introduction to parallel algorithms. Optimization issues

#### **Unit IV**

Various kinds of data processing frameworks batch processing, map-reduce processing, stream processing, real time processing. Introduction to the map-reduce pattern, examples and computing platforms like Hadoop. Introduction to Stream processing, difference between stream and real time processing. Examples of stream processing applications

#### Unit V

Cloud computing fundamentals virtualization, batch-transactional-continuous workloads, execution models. Identifying work loads. Scalable web apps, batch processing, disaster recovery. Examples of cloud playforms – AWS, Azure etc, and usage scenarios

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabas HYDERABA DE Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Desmied-to-be-University Under Section 3 of the USC ACT, 1956)

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- The student will have an appreciation of the various architectures used for data processing
- The student will understand the overall system architecture for data processing, and will be able to understand popular cloud platforms used for data processing in terms of their architecture

IcfaiTech - CURRISULUM&SYLLAMIS, JEHR, Hyderabad
REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER E

(Deemed-to-be-University Lingui Section 3 of the

Course No: DS403	Course Title: Data Visualization	L	P	U
Course No: DS403	Course Title: Data Visualization	3	0	3

- To get familiar with different visualization techniques using excel, python, Tableau and PowerBI.
- To introduce visual perception and core skills for visual analysis.
- To understand visualization for information and dashboard design.
- To understand the working of visualization software

#### **Course Contents**

## **UNIT-I**

Foundation for a Science of Data Visualization: Need of visualization, block diagram of visualization, Visualization Stages, Experimental Semiotics Based on Perception, A Model of Perceptual Processing. Data and Image models: Types of Data, Coding Words and Images, The Nature of Language, Visual and Spoken Language, Animated Visual Languages

#### **UNIT-II**

Introduction of visualization design: The Perceptual Evaluation of Visualization Techniques and Systems, Structural Analysis, Statistical Exploration, Cross-Cultural Studies and Child Studies, Practical Problems in Conducting User Studies, Exploratory data analysis: Introduction to EDA, Basic statistical methods to understand the data.

## Case study:

1. Perform exploratory data analysis on 2012-13 European football(Soccer) dataset in excel and python

#### **UNIT-III**

Visualizing Multidimensional Metadata: Interactive Tables, scatter plots, Parallel Coordinates, star plots, Interactive Histograms, circular histograms. Graphical perception: Visual perception, Simple Model of Visual Perception, different methods of graphical perception.

#### Case study:

1. Use supermarket dataset to explore all visualization techniques in python

#### **UNIT-IV**

Visualization software: Tableau: Introduction to Tableau, Advantages and disadvantages of Tableau, basic functionality, different case studies using Tableau. Microsoft Power BI: Introduction to Power BI, Advantages and disadvantages of Power BI, basic functionality, different case studies using Power BI.

HYDERABA

Case study:

1. Explore IPL 2020 dataset using Tableau

2. Explore 2012–13 European football (socces) using Power

IcfaiTech – CURRICULUM&SYLLABUS, IFHE, Hyderabad \*\* B.Sc (P.

\* B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-he-University Under Section 3 of the UGC ACT, 1954)

#### UNIT- V

Interacting with Visualizations: Data Selection and Manipulation Loop, Exploration and Navigation Loop. Thinking with Visualizations: Memory Systems, Eye Movements, Problem Solving with Visualizations, Creative Problem Solving. Introduction to colors: Color Measurement, CIE System of Color Standards, Opponent Process Theory, Color Appearance, Applications of Color in Visualization. Space Perception and the Display of Data in Space: Depth Cue Theory, Task-Based Space Perception

## Case study:

# Using real time examples to understand the application of colors in the visuals Text Books:

- 1. Information Visualization: perception and design, Colin Ware 2nd edition, Omrgan Kaufmann publisher, 2004
- 2. Visualizing data: Exploring and explaining data with the processing environment, Ben Fry O'Reilly, 1<sup>st</sup> edition, 2008.

## **Reference Books:**

- 1. Data Points: Visualization that means something, Nathan Yau Wiley, 1st edition, 2013.
- 2. Now you see it: Simple Visualization techniques for quantitative analysis, Stephen Few Analytics Press, 1<sup>st</sup> edition, 2009.
- 3. Information Visualization, Dr. Keith Andrews, 2016.

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Understand and visualize the data in a better way.
- Implement different case studies according to the data.
- Infer from data and tell stories based on data.
- Use different open source tools for data analysis and visualization.

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderahad

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACCOUNTS)

Course No: DS404	Course Titles Die Dote Systems	L	P	U	1
Course No: DS404	Course Title: Big Data Systems	3	0	3	

The course develops the following competencies:

- Student should estimate and analyze different known scientific methods and approaches in terms of data collection, storage and processing.
- Student should be capable to make managerial decisions, to assess their consequences and to bear responsibility for the outcomes.
- These indicated and contributed during the preparation of explanation and analysis of the particular area for data collection, storage and processing, particular market and business-model.
- Students should identify and make prognoses about modern approaches on increasing business efficiency.
- Students should identify and choose optimal solutions for improving it-infrastructure and business architecture of the company after implementation relevant big data collection, storage and processing processes. Few Case studies were carried out on Map Reduce Concept, Hive and Spark.

#### **Course Contents:**

#### **UNIT-I**

What is Big Data and where it is produced? Rise of Big Data, Compare Hadoop vs traditional systems, Limitations and Solutions of existing Data Analytics Architecture, Attributes of Big Data, data warehouse v/s Data Lakes, other technologies vs Big Data. What is Hadoop? Hadoop History, Distributing Processing System, Core Components, HDFS Architecture, Hadoop Master — Slave Architecture, Daemon types - Learn Name node, Data node, Secondary Name node.

#### UNIT-II

What is Hadoop Cluster? Pseudo Distributed mode, Type of clusters, Hadoop Ecosystem, Pig, Hive, Oozie, Flume, SQOOP. Overview of MapReduce Framework, MapReduce Architecture, Learn about Jobtracker and Task tracker, Use cases of MapReduce, Anatomy of MapReduce Program. A case study of tuning MapReduce for efficient Bioinformatics in the cloud.

#### **UNIT-III**

Hive DDL – Create/Show/Drop Tables, Hive DML – Load Files & Insert Data, Hive Architecture & Components, Partitions in Hive, PIG Architecture & Data types, Shell and Utility components, PIG Latin: File Loaders and UDF, Programming structure in UDF, PIG, limitations of PIG.No SQL Databases: HBase Architecture, HBase Components, Storage Model of HBase, Object Data Stores-S3, HBase vs RDBMS, Introduction to Mongo DB, CRUD, Advantages of Mongo DB, Ver RDBMS, Ver RDBMS, Introduction to Mongo DB, CRUD, Advantages of Mongo DB, CRUD, Advantages of

\* NO!

IcfaiTech – CURRICULUM&SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deenried-to-be-University Under Section 3 of the UGC ACT, 1956)

#### **UNIT-IV**

Introduction to Data Analysis with Spark, Core Spark Concepts, Programming with RDDs, RDD Basics, Creating RDDs, RDD Operations, Passing Functions to Spark. Advanced Spark Programming: Accumulators, Broadcast Variables, Working on a Per-Partition Basis, Piping to External Programs, Numeric RDD Operations Spark Runtime Architecture, Deploying Applications with spark-submit,

## **UNIT-V**

Spark SQL & Spark Streaming: Using Spark SQL in Applications, Loading and Saving Data From RDDs, JDBC/ODBC Server, and User-Defined Functions. Introduction to Mahout: Why Mahout, Data too large for single machine Data already on Hadoop, Algorithms implemented in Mahout, Setting up the development environment, Mahout API, Parallel versus in-memory execution mode. A case study: Apache Spark at Yahoo.

#### **Text Books:**

1. Oreilly.Hadoop.The.Definitive.Guide.3<sup>rd</sup>.Edition.Jan.2012.

#### **Reference Books:**

- 1. Hadoop: The Definitive Guide, 4<sup>th</sup> Edition. Publisher: O'Reilly Media, Inc. Release Date: April 2015.
- 2. Learning Spark Lightning-Fast Big Data Analysis. 1st edition, 2015.
- learning-apache-mahout. By Chandramani Tiwary, 1<sup>st</sup> Edition, Publisher: Packt Publishing, Release Date: March 2015.
   (<a href="https://www.oreilly.com/library/view/learning-apache-mahout/9781783555215/">https://www.oreilly.com/library/view/learning-apache-mahout/9781783555215/</a>)

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- To understand Big Data concepts, including cloud and big data architectures.
- To motivate and explain trade-offs in big data processing technique design and analysis.
- To apply non-relational databases, the techniques for storing and processing large
- volumes of structured and unstructured data, as well as streaming data.
- To Integrate Apache Mahout with newer platforms such as Apache Spark
- To meet the industry needs with help of a few case studies discussed and practiced technologies.

IcfaiTech – CURRICUL MASYLLABUS, IFHE, Hyderabaur ABI
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UGC ACT, 1256)

. 1	Course No: DS405	Course Titles Deal Time Amphytics	L	P	U	
	Course No: D8405	Course Title: Real Time Analytics	3	0	3	

- To know how to understand the social media data like Facebook, Twitter and YouTube.
- To understand how to extract and analyze the social media data using real time case studies.
- To learn various text mining techniques
- To design and understand the different visualization tools and techniques

#### **Course Contents**

#### **UNIT-I**

Harnessing Social Data (Facebook): Connecting, Capturing, and Cleaning, Uncovering Brand activity, Emotions, Facebook API ecosystem and method to extract data. Feature extraction and content analysis using keywords, hashtags, and noun phrase. Case study: Emotion Analysis, Apache Kappa Architecture.

#### UNIT- II

Analyzing Twitter data: Twitter data extraction using REST and Streaming API, Sentiment analysis application. Case study: Sentiment Analysis.

## UNIT-III

Analyzing YouTube data: Analysis of structured and unstructured data, Characteristics of YouTube, Channel popularity using traffic and sentiment data from user comments.

## UINT - IV

Text Mining and Analytics: Text representation, word association mining and analysis, Description of stopword removal, stemming, and POS tagging, analyse and filter the Twitter data using MAXQDA, Flight data analysis. Case Study: Segregare the Restaurants reviews (Text Analytics)

## **UNIT-V**

Visual Representation: Design principles, statistical graphs, maps, trees and networks, high dimensional data, data visualization tools.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabat

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

#### **Text Books:**

- 1. Python Social Media Analytics by Siddhartha Chatterjee and Michal Krystyanczuk, Publisher: Packt Publishing Limited, 1<sup>st</sup> Edition, 2017.
- 2. Mining Text Data, Editors, Charu C. Aggarwal, ChengXiang Zhai, Publisher Springer-Verlag New York, 1st Edition, 2012.

#### **Reference Books:**

- 1. Text Analytics with Python: A Practical Real-World Approach to Gaining Actionable Insights from your Data, 2016 by Dipanjan Sarkar, Publisher: Apress; 1st edition, 2016.
- 2. Mastering Social Media Mining with Python y Marco Bonzanini, Publisher: Packt Publishing Limited, 1<sup>st</sup> Edition, 2016.
- 3. Real-Time Big Data Analytics, Sumit Gupta, Shilpi Saxena, Packt Publishing Ltd, 1<sup>st</sup> Edition, 2016.
- 4. Kafka: The Definitive Guide Real-time Data And Stream Processing At Scale, Neha Narkhede, Gwen Shapira & Todd Palino, O'Reilly Media, Inc., 1<sup>st</sup> Edition, 2017

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Summarize and analyze the social media data
- Make inference about emotion and sentiment analysis from social media data that will create employability opportunities for the diverse stakeholder groups.
- Fit, interpret, and assess models with one or more predictors
- Visualize the data gathered from various social media

IcfaiTech - CURRICH LA SSEA ABUS, IFHE, Hyderabad D.Sc (Physics) and B.Tech.(DS&AI)

OR HIGH

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UCC set 1, 1956)

THE ROPAL FORMULATION FOR HIGHER EDUCATION

CONTROL IN LIGHTUP VICTOR SERVING OF the USE ALC. 1955.

Course No: DS406	Course Title: Natural Language Processing	L	P	U
Course No: DS400	Course Title: Natural Language Processing	3	0	3

- To teach students the leading trends and systems in natural language processing.
- To understand the concepts of morphology, syntax, semantics and pragmatics of the language and that they are able to give the appropriate examples that will illustrate the above mentioned concepts.
- Teach them to recognize the significance of pragmatics for natural language understanding using real time case studies.
- Enable students to be capable to describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

#### **UNIT I**

Introduction – Human languages, models- Regular Expressions-Patterns – Finite State Automata, Morphology - Inflectional Morphology - Derivational Morphology, Finite-State Morphological Parsing, Construction of a finite-state lexicon, Finite state Transducers (FST), Porter Stemmer, Word and Sentence Tokenization, Spelling Correction: Minimum Edit Distance

## **UNIT II**

N-Grams Models of Syntax - Counting Words - Unsmoothed Ngrams, Training & Test Sets, Smoothing- Interpolation -Back-off Deleted Interpolation - Entropy - English Word Classes - Tag-sets for English, Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging.

Case Study: Word Prediction Using Stupid Backoff With a 5-gram Language Model on Corpus data from a list of blog posts.

## **UNIT III**

Context Free Grammars for English Syntax- Context Free Rules and Trees, Sentence- Level Constructions— Agreement — Sub Categorization, Parsing — Top-down — Bottom-Up-CKY Parsing- The Earley Algorithm, Statistical Parsing— Probabilistic Context-Free Grammars, Feature Structures

#### **UNIT IV**

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus, Representing Linguistically Relevant Concepts – Syntax Driven Semantic Analysis - Semantic Attachments – Syntax Driven Analyzer - Robust Analysis - Lexemes and Their Senses – Internal Structure - Word Sense Disambiguation - Information Retrieval.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyders and DERABA DE Sc (Physics) and B. Tech. (DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER
(Deemed-to-be-University Under Section 9)

1956

Case Study: The case study is to introduce a predictive approach, which consists of predicting sentiments based on opinions collected from the well-known social network Twitter.

#### **UNIT V**

Discourse -Reference Resolution - Text Coherence - Discourse Structure - Coherence ,Dialog and Conversational Agents - Dialog Acts - Interpretation - Conversational Agents - Language Generation - Architecture - Surface Realizations - Discourse Planning ,Machine Translation - Transfer Metaphor-Interlingua - Statistical Approaches.. Named Entity.

Case Study: Basic NLP and Named Entity Extraction from any of the Wikipedia page

#### **Text Books:**

- 1. Daniel Jurafsky and James H Martin,"Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008.
- 2. C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA, Second Printing, 1999.

#### **Reference Text Books:**

- 1. James A. Natural language Understanding, Pearson Education, 2<sup>nd</sup> Edition, 1994.
- 2. Bharati A., Sangal R., Chaitanya V. Natural language processing: a Paninian perspective, PHI, 2000.
- 3. Siddiqui T., Tiwary U. S. Natural language processing and Information retrieval, OUP, 2008.

## List of Natural Language Processing Laboratory Experiments:

S No.	Experiments	Duration
1	File Handling in Documents in PYTHON	1:40 H
2	Regular Expressions in Natural Language Processing	1:40 H
3	Data Preprocessing: Tokenization	1:40 H
4	Data Preprocessing: Stemming and Lemmatization	1:40 H
5	Language Modeling using N-Grams	1:40 H
6	Part Of Speech Tagging using Corpus GHER	1:40 H

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, HATERANGERAS

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Understand approaches to syntax and semantics in NLP.
- Understand approaches to discourse, generation, dialogue and summarization within NLP.
- Understand current methods for statistical approaches to machine translation.
- Provide the student with knowledge of various levels of analysis involved in NLP.
- Understand the applications of NLP.
- Gain knowledge in automated Natural Language Generation and Machine Translation.
- Understand the mathematical and linguistic foundations underlying approaches to the above areas in NLP
- Understand the underlying concepts of Autocorrect and Autocomplete, Language Translator, Social Media Monitoring, Chabot, Survey Analysis, Targeted Advertising, Voice Assistants, Grammar Checkers and Email Filtering.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hederabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

Carras No. DC407	Course Titles Soft Commuting	L	P	U
Course No: DS407	Course Title: Soft Computing	3	0	3

- To provide an introduction to the basic principles, techniques, and applications of soft computing.
- Provide the mathematical background for carrying out the optimization associated with neural network learning and Particle Swarm Optimization.
- To develop some familiarity with current research problems in Soft Computing by working on research projects.
- Few Case studies were carried out on Genetic Algorithms, Artificial Neural Networks and Particle Swarm Optimization.

#### UNIT-I

Introduction to Soft Computing: Concept of computing systems, "Soft" computing versus "Hard" computing, Characteristics of Soft computing, Some applications of Soft computing techniques

## **UNIT-II**

Fuzzy logic: Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Defuzzification techniques, Fuzzy logic controller design, Some applications of Fuzzy logic.

#### **UNIT-III**

Genetic Algorithms: Concept of "Genetics" and "Evolution" and its application to probabilistic search techniques, Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, Solving single-objective optimization problems using GAs. Electricity estimation using genetic algorithm approach: a case study of Turkey.

## **UNIT-IV**

Artificial Neural Networks: Biological neurons and its working, Simulation of biological neurons to problem solving, Different ANNs architectures, Training techniques for ANNs, Applications of ANNs to solve some real life problems. An artificial neural network case study: the control of work-in-process inventory in a manufacturing line.

#### **UNIT-V**

Particle Swarm Optimization: Introduction ,Convergence Analysis, Performance Illustration , Applications in Hidden Markov Models,SwamAlgorithms,Main Concerns to handle discrete problems, Applications to discrete problems.Particle swarm optimization for sequencing problems: a case study.

IcfaiTech - CURINEUL BASYLLABUS, IFHE, HYGEADAD
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemod to be University Under Section 3 of the UGC 1974)

B.\$c (Physics) and B.Tech.(DS&AI)

REGISTRAR

## **Text Books:**

- 1. Introduction to Soft Computing, Authors: Udit Chakraborty, Samir Roy, Pearson India, 1<sup>st</sup> Edition, 2013.
- 2. Swam Intelligence and Bio-Inspired Computation, 1st Edition, Elsiver, Xin-She Yang Zhihua Cui, 2<sup>nd</sup> Edition, 2013.

## References:

- 1. Fuzzy Logic: A Pratical approach, F. Martin, Mc neill, and Ellen Thro, Morgan Kaufmann Pub; Pap/Dskt edition (August 1, 1994)
- 2. Fuzzy Logic with Engineering Applications, Timothy J. Ross, Willey, 3<sup>rd</sup> Edition, 2010.
- 3. Foundations of Neural Networks, Fuzzy Systems, and Knowldge Engineering, Nikola K. Kasabov, First Priniting, MIT Press, 1998.
- 4. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press, First Priniting, 2000.
- 5. Soft Computing, D. K. Pratihar, Narosa, Revised Edition, 2018.

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Describe Fuzzy logic and its applications.
- Analyze artificial neural networks and its applications.
- Analyze Particle Swam Optimization and its applications
- Solve single-objective optimization problem's using GAs.
- Solve multi-objective optimization problems using Evolutionary algorithms (MOEAs).
- Apply Soft computing techniques to solve problems in varieties of application domains.
- To meet the industry needs with help of a few case studies discussed and practiced technologies.

cfa iThe Charles For Higher Education
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICENTED IN

Course No: DS408	Course Title: Human Computer Interaction	L	P	U	
Course No: D8408	Course Title: Human Computer Interaction	3	0	3	Ì

- Demonstrate an understanding of guidelines, principles, and theories influencing
- Recognize how a computer system may be modified to include human diversity.
- Select an effective style for a specific application, design mock ups and carry out user and expert evaluation of interfaces.
- Carry out the steps of experimental design, usability and experimental testing, and evaluation of human computer interaction systems.
- Use the information sources available, and be aware of the methodologies and Technologies supporting advances in HCI
- Understand the Industry oriented projects through Case Study

## Unit-I

The User Interface: An introduction and Overview- Importance of user Interface-definition-importance of good design - Benefits of good design - A brief history of Screen design. The graphical user interface: Popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user –interface popularity, characteristics- Principles of user interface.

Case Study on User interface designs

#### **Unit-II**

User Interface Design Process: Obstacles and Pitfalls in development-Designing for people-Usability – Common usability problems, Human interaction with computers, importance of human characteristics in design, Human consideration, Human interaction speeds, understanding business junctions.

Case study on Business Case Analysis.

## **Unit-III**

Screen Designing: Design goals, Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, Visually pleasing composition, amount of information, focus and emphasis, presentation information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design. System Menus: Menu- Structures, Functions, Content, Formatting, Selecting menu choices.

## Unit-IV

Navigation Schemes: Navigation Menus, Graphical Menus- Types-Examples, Windows-Characteristics, Components, Presentation Styles- Types, Window Operations. Web Systems, Device and Screen based Controls: Frames-Pop up Windows, Device based Controls – Characteristics and Selection, Operable, Read Only, selection, custom and presentation controls.

IcfaiTech - CURRICULUM&SYLLABUS, IF Hyderabad

THE ICFAI FOUNDATION FOR HIGHER FOLICE (Deemed to be University Under Section 3 of the

## Unit-V

Texts & Messages: Words, Sentences, Messages and Texts, Multimedia, creating meaningful graphics, Icons and Images, Colors, Choosing Proper colors-Uses, problems- Choosing colors for textual and statistical graphics screens. Testing: OOTB, Ubiquitous Computing and augmented Realities, Usability Testing – Purpose, Importance, and Scope, prototypes, kinds of test, conducting the test Case study on Digital Promise

#### **Text Books:**

1. The Essential Guide to User Interface Design, Wilbert O.Galitz, Wiley India Edition, 2<sup>nd</sup> Edition, 2002.

## Reference Book(s):

- 1. Human Computer Interaction, Alan Dix, Janet Finlay, Goryd, Abowd, Russell Beal, PEA, 3<sup>rd</sup> Edition, 2004.
- 2. Designing the User Interface, Ben Shneiderman, PEA, 4th Edition, 2004.
- 3. Building Interactive Systems: Principles for Human-Computer Interaction, Dan R. Olsen, Jr. ISBN-13:9789353500085, 1st Edition Cengage, 2010.

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Design, implement and evaluate effective and usable graphical computer interfaces.
- Describe and apply core theories, models and methodologies from the field of HCI.
- Describe and discuss current research in the field of HCI.
- Implement simple graphical user interfaces using the Java Swing toolkit.
- Describe special considerations in designing user interfaces for older adults.
- Develop Various Case Studies in the Industry

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyperabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

C Na. DC400	Course Title: Commuter Vision	L	P	U
Course No: <b>DS409</b>	Course Title: Computer Vision	3	0	3

- Recognize and describe both the theoretical and practical aspects of computing with images. Connect issues from Computer Vision to Human Vision
- Describe the foundation of image formation and image analysis. Understand the basics of 2D and 3D Computer Vision.
- Get an exposure to advanced concepts leading to object and scene categorization from images.

# **Prerequisites:**

- Data structures
- Programming (Python preferably)
- Math: Linear algebra, vector calculus, and probability.

#### **Course Contents**

## **UNIT-I**

Introduction to Image Processing and Computer Vision: What is Computer Vision? History of computer vision. Digital Images. Structure of Human Eye and Vision. Goals and Tasks of Image Processing. Contrast and brightness correction.

#### **UNIT-II**

Image Formation and Filtering: Geometric primitives and transformations, Photometric image formation, the digital camera, Point operators, linear filtering, pyramids and wavelets, Hierarchical motion estimation.

# **UNIT-III**

Feature Detection and Matching: Points and Patches, Feature descriptors, Feature matching, Feature tracking, Edges, Edge detection, Edge linking, Lines, Successive approximation, Hough transforms, Robust least squares and RANSAC, Applications on Points, Edges, Lines.

#### **UNIT-IV**

Multiple Views and Motions: Stereo intro and Camera calibration, Epipolar Geometry and Structure from Motion, Stereo Correspondence and Optical Flow.

Case study: Development of Image Analysis Software for Automated Optical Inspections.

OR HIGA

IcfaiTech - CURRICULUM SYLLABUS, IFH Juyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER ECTIVAL
(Deemed to be University Under Section 3 of the

#### **UNIT-V**

Recognition: Recognition and Bag of Words Detection with sliding windows: Viola Jones, Face Recognition, Instance Recognition.

Case study: Development of a Facial Recognition Application for Retail.

#### **Text Books:**

- 1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag, London Limited 2011.
- 2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.

#### References:

- 1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
- 2. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.
- 3. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Addison-Wesley, 1992.
- 4. http://vision.stanford.edu/teaching/cs223b/syllabus.html

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Understand the major technical approaches involved in computer vision.
- Describe various methods used for registration, alignment, and matching in images.

HYDERAB

• Build computer vision applications.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hydera

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 195

Carre	. No. DC410	Course Title: Distributed Cloud Computing	L	P	U
Cours	ourse No: DS410   Course Title: Distributed Cloud Computing	3	0	3	

- Understand the underlying infrastructure and architecture of clouds, techniques for enabling services and the quality of such services.
- Analyse various levels of services that can be achieved by cloud computing.
- Understand the programming aspects of cloud computing using different tools and techniques.
- Identify research related issues of cloud computing in performance, security and management.
- Analyse real life case studies and showcase importance of computing models

# Prerequisites:

Basic programming

#### **Course Contents**

#### **UNIT-I**

Concepts of Distributed Computing: Introduction to distributed computing, Parallel vs Distributed computing, Elements of parallel computing, Elements of distributed computing, Service oriented computing.

## **UNIT-II**

Concepts of Cloud Computing: About cloud computing, Building cloud computing environment, Cloud computing platforms and technologies, System models for distributed and cloud computing.

Case study: Education training organization's implementation of cloud on AWS

#### **UNIT-III**

Virtual machines and Virtualization of Clusters and Data centers: Implementation levels of virtualization, Virtualization structures/tools and mechanisms, Virtualization of CPU, memory and I/O devices, Virtual clusters and resource management, Virtualization for data-center automation.

## **UNIT-IV**

Programming Enterprise Clouds using Aneka: Introduction, Aneka Architecture, Thread Programming using Aneka, Task Programming: using Aneka, Map Reduce Programming using Aneka. Monitoring, Management and Applications: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting Cloud Applications in the AWS cloud, Building Content Delivery networks using Clouds, Resource Cloud Mashups.

Case study: MOOC implementation of cloud on AWS

IcfaiTech - CURRICULES WAS AS LABUS, IFHE, Hyder and
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the Utility)

B.sc (Physics) and B.Tech.(DS&A1)

THE ICEAL FOUNDATION FOR IN

#### **UNIT-V**

Cloud Applications & Security: Scientific Applications, Business and Consumer Applications, security aspect of cloud computing.

Case study: Online hospitality service implementation on AWS cloud

#### **Text Books:**

- 1. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 1<sup>st</sup> Edition, 2013.
- 2. Distributed and Cloud Computing, Kai Hwang, Geoffery C.Fox, Jack J.Dongarra, Elsevier, 1<sup>st</sup> Edition, 2012.

#### References:

- 1. Cloud Computing: A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill, 1st Edition, 2017.
- 2. Enterprise Cloud Computing, GautamShroff, Cambridge University Press, 1<sup>st</sup> Edirion, 2010.
- 3. Cloud Computing: Implementation, Management and Security, John W. Ritting house, James F.Ransome, CRC Press, 1<sup>st</sup> Edition, 2009.
- 4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly, 1st Edition, 2009.
- 5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, 1st Edition, 2011

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Understand the distributed and cloud computing infrastructure, architecture, system models, enabling technologies and its paradigms
- Analyze the service and deployment models of cloud computing and related issues
- Program on cloud development platforms.
- Apply computing concepts and models in real life situations by analysing the case studies

FORA

HYDERAF

IcfaiTech – CURRICULUM&SYLLABUS, IFHE, Hyderaba
REGISTRAR

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the U6C ACT, 1956)

Commo No. DC411	Course Titles Intermet of Things	L	P	U
Course No: DS411	Course Title: Internet of Things	3	0	3

- Smart Lighting, Smart Appliances, Intrusion Detection, and Smoke/Gas Detectors. Cities-Smart Parking, Smart Lighting, Smart Roads, Structural Health Monitoring, Surveillance, Emergency Response.
- Environment-Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection.
- Energy- Smart Grids, Renewable Energy Systems, Prognostics.
- Retail-Inventory Management, Smart Payments, Smart Vending Machines, Logistics-Route Generation & Scheduling, Fleet Tracking, Shipment Monitoring.
- Remote Vehicle Diagnostics, Agriculture-Smart Irrigation, GreenHouse Control, Industry – Machine Diagnosis & Prognosis Indoor Air Quality Monitoring, Health & Lifestyle – Health & Fitness Monitoring, Wearable Electronics.

## **Prerequisites**

Operating Systems, Computer Networks, computer Architecture, Programming Languages

#### **Course Contents**

## **UNIT-I**

Introduction to Internet of Things: Introduction - Definition & Characteristics of IoT , Physical Design of IoT- Things in IoT , IoT Protocols, Logical Design of IoT- IoT Functional Blocks, IoT Communication Models, IoT Communication APIs , IoT Enabling Technologies-Wireless Sensor Networks , Cloud Computing, Big Data Analytics , Communication Protocols , Embedded Systems, IoT Levels & Deployment Templates.

# UNIT-II

Domain Specific IoTs: Home Automation: Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors. Cities-Smart Parking, Smart Lighting, Smart Roads, Structural Health Monitoring, Surveillance, Emergency Response. Environment-Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection. Energy- Smart Grids, Renewable Energy Systems, Prognostics. Retail-Inventory Management, Smart Payments, Smart Vending Machines, Logistics-Route.

Retail-Inventory Management, Smart Payments, Smart Vending Machines. Logistics-Route Generation & Scheduling, Fleet Tracking, Shipment Monitoring, Remote Vehicle Diagnostics. Agriculture-Smart Irrigation, Green House Control. Industry –Machine Diagnosis & Prognosis Indoor Air Quality Monitoring. Health & Lifestyle –Health & Fitness

Monitoring, Wearable Electronics

IcfaiTech - CURRICULIMESYLLABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER IN (Deemed-to-be-University Under Section 3 of

#### UNIT-III

IoT and M2M: Introduction, M2M-Difference between IoT and M2M, SDN and NFV for IoT-Software Defined Networking, Network Function Virtualization.

## **UNIT-IV**

IoT Platforms Design Methodology: IoT Design Methodology-Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device & Component Integration, Application Development, Case Study on IoT System for Weather Monitoring, Motivation for Using Python IoT Physical Devices & Endpoints. What is an IoT Device-Basic building blocks of an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces – Serial, SPI, I2C, Programming Raspberry Pi with Python-Controlling LED with Raspberry Pi, Interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi, Other IoT Devices- pc Duino, Beagle Bone Black, Cubieboard.

#### **UNIT-V**

IoT & Beyond: Use of Big Data and Visualization in IoT, Industry 4.0 Concepts. Overview of RFID, Low-power design (Bluetooth Low Energy), range extension techniques (data mining and mesh networking), and data intensive IoT for continuous recognition applications. Overview of Android / IOS App Development tools & Internet of Everything.

#### **Text Books:**

1. Internet of Things, A Hands on Approach, by Arshdeep Bahga & Vijay audisetti, University Press, 1<sup>st</sup> Edition, 2018.

## **Reference Books:**

- 1. The Internet of Things, by Michael Millen, Pearson, 1st Edition, 2018
- 2. Sinha A.N and Udai A.D, Computer Graphics, 1st Ed., TMH, 2012

IcfaiTech - CURRICULUM&SYLLARUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

\* Bsc (Physics) and B.Tech.(DS&AI)

A CONTRACTOR OF THE PARTY OF TH

HYDERAB

# List of Internet of Things Laboratory Experiments:

S.no	Experiments	Duretion
1	Familiarization with Raspberry Pi and perform necessary software installation.	1:40 H
2	To interface LED/Buzzer with Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.	1:40 H
3	To interface Push button/Digital sensor (IR/LDR) with Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.	1:40 H
4	To interface DHT11 sensor with Raspberry Pi and write a program to print temperature and humidity readings.	1:40 H
5	To interface motor using relay with Raspberry Pi and write a program to turn ON motor when push button is pressed.	1:40 H
6	To interface OLED with Raspberry Pi and write a program to print temperature and humidity readings on it.	1:40 H
7	To interface Bluetooth with Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.	1:40 H
8	Write a program on Raspberry Pi to upload temperature and humidity data to Thing speak cloud.	1:40 H
9	write a program on Raspberry Pi to retrieve temperature and humidity data from Thing speak cloud.	1:40 H
10	To install SQLite3 database on Raspberry Pi and perform basic SQL queries.	1:40 H
11	Write a program on Raspberry Pi to publish temperature data to MQTT broker.	1:40 H
12	Write a program on Raspberry Pi to subscribe to MQTT broker for temperature data and print it.	1:40 H
13	Write a program to create TCP server on Raspberry Pi and respond with humidity data to TCP client when requested.	1:40 H
14	Write a program to create UDP server on Raspberry Pi and respond with humidity data to UDP client when requested.	1:40 H

IcfaiTech — CURRICRE GASTARABUS, IFHE, Hyderabatton B.Sc (Physics) and B.Tech.(DS&AI)
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the USC & C. 1956)

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Understand the building blocks of IoT technology and explore the vast spectrum of IoT applications.
- Use processors & peripherals to design & build IoT hardware.
- Assess, select and customize technologies for IoT applications.
- Connect the cyber world with the physical world of humans, automobiles and factories.
- Integrate geographically distributed devices with diverse capabilities.
- Design and implement IoT applications that manage big data.

IcfaiTech - CURRICHLUM SYL BEIGNSTFIAR Hyderabad

(Deemed to be University Under Section 3 of the UGC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICEANED BOTT

Course No: DS412	Course Title: Security and Privacy in Cloud	L	P	U
Course No: DS412	Computing	3	0	3

- Cloud computing security escalates in importance and evolves, it is important that enterprises understand how to best handle the paradigm change in business operations that the cloud presents.
- Introduces privacy aspects to consider within the context of cloud computing, and analyzes the similarities and differences with traditional computing models.
- To highlight legal and regulatory implications related to privacy in the cloud.
- Understand the Industry oriented projects through Case Study

#### **Course Contents**

#### **UNIT-I**

INTRODUCTION: Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model, Cloud Deployment Models. INFRASTRUCTURE SECURITY: Network level model, The Host level, The Application level model.

Case Study: The Cloud Security Alliance

#### **UNIT-II**

DATA SECURITY AND STORAGE: Aspects of Data Security, Data Security Mitigation, Provider Data and Its Security, Data privacy and security Issues.

Case Study: Data Security Improvement In Azure And AWS Platforms

## **UNIT-III**

Access Management: Jurisdictional issues raised by Data location, Identity & Access Management, Access Control, Trust, Reputation, Risk, Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.PRIVACY: What Is Privacy? What Is the Data Life Cycle, What Are the Key Privacy Concerns in the Cloud, Who Is Responsible for Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications?

Case study: On AWS Identity and Access Management

#### **UNIT-IV**

AUDIT AND COMPLIANCE: Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Illustrative Control Objectives for Cloud Computing, Incremental CSP-Specific Control Objectives, Additional Key Management Control Objectives, Control Considerations for CSP Users , Regulatory/External Compliance , Other Requirements , Cloud Security Alliance. Case study on Centralizing SSI Key Management with AWS EC2

IcfaiTech - CURRICULTURS LLABUS, IFHE, Hymer Bad B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGH (Deemed to be University Under Section 3)

#### UNIT- V

Description of data processing flows, Using PETs, International Telecommunication Union (ITU), International Organization for Standardization (ISO), Organization for the Advancement of Structured Information Standards (OASIS).

#### **Text Books:**

- 1. Cloud security and privacy- Tim Mather, Subra Kumaraswamy, and Shahed Latif-O'REILLY Publications-September 2009: First Edition.
- 2. Cloud Security: A Comprehensive Guide to Secure Cloud Computing. Krutz R. L. & Vines R. D. Wiley-India. 2010.

## **Reference Books:**

1. Cloud Computing. Miller M. Pearson Education. New Delhi. 2009.

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- To understand the concept of cloud computing and the evolution of computing into cloud computing.
- Able to understand infrastructure security refers to the established security capabilities at the network.
- Able to understand the current state of data security and the storage of data in the cloud, including aspects of confidentiality, integrity, and availability.
- To gain indepth knowledge of audit and compliance functions within the cloud, and the various standards and frameworks.
- To Develop Various Case Studies in the Industry.

HYDERABAD EN PROPERTIES AND PROPERTI

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad/ \* B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to-be-University Under Section 3 of the UGC ACT, 1956)

C N DC412	Course Titles Claud Administration	L	L P	U
Course No: DS413 Course Title: Cloud Administration	3	0	3	

- Understand all aspects of cloud provisioning and administration
- Apply the administration concepts in an enterprise cloud computing environment.
- Establish best practices for performance measures and monitoring of cloud computing environment
- Understand the Industry oriented projects through Case Study

## **Prerequisites:**

- Networking
- Basic programming

#### **Course Contents**

## **UNIT-I**

Cloud Resource Administration and Provisioning: Fundamentals of Cloud Computing and Administration, Planning and analysis of Workload and Capacity, Administering of various Cloud Technologies, Virtual Storage.

Case study: Migrate with AWS

## **UNIT-II**

Cloud Administration using Scalability and Elasticity: Cloud Scalability Administration, Cloud Elasticity Administration.

Case Study: OPenstack Installation and Cloud Manage Resource management.

HYDERABA

## **UNIT-III**

Cloud Interoperability & Portability: Introduction to Cloud Interoperability & Portability, Strategic Planning for Interoperability and Portability.

Case Study: Healthcare Data Interoperability with the AWS Cloud

## **UNIT-IV**

Cloud Administration Management: Various Policies Management for SLA, Metering and Billing Management, Privacy and Data Management.

Case Study: Amazon Compute Service Level Agreement

## **UNIT-V**

Disaster Recovery & Security Administration:

Security issues in Cloud Administration

Recovery, Fundamental

IcfaiTech – CURRICULURE SINTERES, IFHE, Hyderabad THE ICFAI FOUNDATION FOR HIGHER EDUCATION

(Deemed-to-be-University Under Section 3 of the UniC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

THE FORM FOUNDATION FOR HIGHER EDIT

In the late Cortice of the 16th A.

## Text Book:

1.The Practice of Cloud System Administration, Designing and Operating Lagre Distributed Systems, Limoncelli Thomas A, Strata R, J. Hogan, Pearson Education, , 1<sup>st</sup> Edistion, 2014.

### References:

- 1. Google Cloud Platform Administration, Ranjit Singh T, Packt Publishing Limited, 1<sup>st</sup> Edition, 2018
- 2. Hands-On Cloud Administration in Azure, Toroman Mustafa, Packt Publishing Limited, 1<sup>st</sup> Edition, 2018

#### Course Outcomes

Upon successful completion of the course, student will be able to:

- Design strategic policies for cloud administration.
- Understand various aspects of disaster recovery & security administration.
- Analyse various management issues in cloud administration.
- Develop Various Case Studies in the Industry.

HYDERABAD E

IcfaiTech – CURRICULUM&SYLLABUS, IFHE, Hyderabad
REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

Course No: DS414	Course Title: Fundamentals of Blockchain	L	P	U
	Technology	3	0	3

# **Prerequisites**

Operating Systems, Computer Networks, computer Architecture, Programming Languages

# **Course Learning Objectives**

This basic course makes the student to

- Understand the fundamentals of Blockchain Technology.
- Identify, analyze, and model structural and behavioral concepts of the Blockchain system.
- Develop, explore the conceptual model into various scenarios and applications.
- Apply the concepts of architectural design for deploying the code for Blockchain Application.
- Understanding the Industry oriented projects through Case Study

### **Course Contents**

### **UNIT-I**

Introduction to Blockchain, Key vocabulary while discussing Blockchain, Distinction between databases and Blockchain Explaining distributed ledger Blockchain ecosystem. Transformation in trading units Cryptography and Cryptocurrency, Anonymity and Pseudonymity in Cryptocurrencies, Digital Signatures, Hash Codes, Distributed networks.

Case Study: Crypto-currency

### UNIT-II

Bitcoin and its history. Selling Bitcoins, Bitcoin transactions, How Bitcoin transactions work, what happens in case of invalid transactions, Parameters that invalidate the transactions, Scripting language in Bitcoin, Applications of Bitcoin script Nodes and network of Bitcoin, Various roles you can play in the Bitcoin ecosystem.

Case Study: Bitcoin-It' Still Speculation

#### **UNIT-III**

Introduction, Purpose of mining, Algorithm used in mining, mining hardware, how does Bitcoin mining work? Bitcoin mining pools how cloud mining of Bitcoin works? Mining incentives, Security and centralizations.

Case Study: Bitcoin Mining

IcfaiTech - CURRICREO STALLABUS, IFHE, Hyderabad

THE ICFAI FOUNDATION FOR HIGHER EDUCATE (Deemed to be University Under Section 3 of the

3.8c Physics) and B.Tech.(DS&AI)

MANAGED LESSES THE COLUMN TO HOMER EDUC

RHIG

### **UNIT-IV**

Introduction, Ethereum, Ether, use of Ethereum, the Ethereum ecosystem, DApps and DAOs, How Ethereum mining works? Learning Solidity: Contract classes, functions, and conditionals, Inheritance & abstract contracts, Libraries, Types & optimization of Ether, Global variables, Debugging, Future of Ethereum.

### **UNIT-V**

Introduction to Hyperledger, Hyperledger Architecture, Consensus, Consensus & its interaction with architectural layers, Application programming interface, Application model, Network topology, Exploring Hyperledger frameworks.

### **Text Books:**

1. Arshadeep Bagha, Vijay Madisetti, "Bkockchain Applications-A hands-on Approach", Universal Press 2018 (Part One).

#### **Reference Books:**

1. Mayukh Mukhopadhyay, "Ethereum Smart Contract Devlopment" Packt Press, 2018 Edition

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Understand the building blocks of Blockchain technology and explore the vast spectrum of Blockchain applications.
- Assess, select and customize technologies for Blockchain applications.
- Integrate geographically distributed devices with diverse capabilities.
- Design and implement Blockchain applications that manage big data.
- Develop Case Study for real life scenario in the Industry.

HYDERABAD THE HOLL

IcfaiTech – CURRICULUM&SYLLABUS, IFHE, Hyderabad REGISTRAR THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 1956

B.Sc (Physics) and B.Tech.(DS&AI)

(Demed)

Course No: DS415	Course Title: Ethereum and Solidity Programming	L	P	U
	Essentials	3	0	3

# **Course Learning Objectives**

- To Introduce Block chain, Ethereum, and Smart Contracts.
- Installing Ethereum and Solidity, Global Variables and Functions.
- Expressions and Control Structures.
- Writing Smart Contracts, Functions, Modifiers, and Fallbacks, Exceptions, Events, and Logging, Truffle Basics.
- Unit Testing, Debugging Contracts.
- Understanding the Industry oriented projects through Case Study

# **Prerequisites**

Operating Systems, Computer Networks, computer Architecture, Programming Languages

### **Course Contents**

## UNIT-I

Cryptography, Symmetric encryption and decryption, Asymmetric encryption and decryption, Hashing, Digital signatures, Ether, Gas, Blockchain and Ethereum architecture, How are blocks related to each other?, How are transactions and blocks related to each other?, Ethereum nodes, EVM, Ethereum mining nodes, How does mining work?, Ethereum accounts, Externally owned accounts, Contract accounts, Transactions, Blocks, An end-to-end transaction, What is a contract?, What is a smart contract?, How to write smart contracts?How are contracts deployed?

Case Study: Ethereum

#### **UNIT-II**

Ethereum networks, Main network, Test network, Ropsten, Rinkeby, Kovan, Private network, Consortium network, Geth, Installing Geth on Windows, Creating a private network, ganachecli, Solidity compiler, The web3 JavaScript library, Mist wallet, MetaMask. Ethereum Virtual Machine, Solidity and Solidity files, Pragma, Comments, The import statement, Contracts, Structure of a contract, State variables, Structure, Modifiers, Events, Enumeration, Functions, Data types in Solidity, Value types, Passing by value, Reference types, Passing by reference, Storage and memory data locations, Rule 1, Rule 2, Rule 3, Rule 4, Rule 5, Rule 6, Rule 7, Rule 8, Literals, Integers, Boolean, The byte data type, Arrays, Fixed arrays, Dynamic arrays, Special arrays, The bytes array, The String array, Array properties, Structure of an array, Enumerations, Address, Mappings.

Case Study: Ethereum Networks

IcfaiTech - CURRICULT GASTRARUS, IFHE, Hyderabad

the UGC ACT, 1956)

B.Sc (Physics) and B.Tech.(DS&AI)

Deemed to be University United Section 3 of the USF

### **UNIT-III**

Types of variables, Variables hoisting, Variable scoping, Type conversion, Implicit conversion, Explicit conversion, Block and transaction global variables, Transaction and message global variables, Difference between tx.origin and msg.sender, Cryptography global variables, Address global variables, Contract global variables. Solidity expressions, The if decision control, The while loop, The for loop, The do...while loop, The break statement, The continue statement, The return statement.

#### **UNIT-IV**

Smart contracts, Writing a simple contract, Creating contracts, Using the new keyword, Using address of a contract, Constructors, Contract composition, Inheritance, Single inheritance, Multi-level inheritance, Hierarchical inheritance, Multiple inheritance, Encapsulation, Polymorphism, Function polymorphism, Contract polymorphism, Method overriding, Abstract contracts, Interfaces, Function input and output, Modifiers, The view, constant, and pure functions, The address functions, The send method, The transfer method, The call method, The callcode method, The delegatecall method, The fallback function.

Case Study: Smart Contract for Government Processes

### **UNIT-V**

Error handling, The require statement, The assert statement, The revert statement, Events and logging, Application development life cycle management, Truffle, Development with Truffle, Testing with Truffle, Debugging, The Remix editor, Using events, Using a Block Explorer.

#### **Text Books:**

1. Solidity Programming Essentials, by Ritesh Modi, Packt Publishing, 2018.

## **Reference Books:**

1. Mayukh Mukhopadhyay, "Ethereum Smart Contract Devlopment" Packt Press, 2018 Edition

### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Learn the basics and foundational concepts of Solidity and Ethereum.
- Explore the Solidity language and its uniqueness in depth.
- Create new accounts and submit transactions to blockchain.
- Get to know the complete language in detail to write smart contracts.
- Learn about major tools to develop and deploy smart contracts.
- Write defensive code using exception handling and error checking.
- Understand Truffle basics and the debugging process.
- Develop Case Study for real life scenario in the Industry.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

\*\* B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1954)

Course No. <b>DS416</b>	Course Title: : Blockchain with AI	L P U	U	
Course No: DS410	Course Title: : Blockenain with Al	3	0	3

# **Course Learning Objectives**

- To teach Hared ledgers, distributed ledgers, bitcoin, and cryptography;
- Key concepts of artificial neural networks, machine learning, and deep learning with real-world examples.
- Smart services within a Blockchain ecosystem such as classification, regression, and image recognition.
- Understanding the Industry oriented projects through Case Study

# **Prerequisites**

Operating Systems, Computer Networks, computer Architecture, Programming Languages

#### **Course Contents**

### UNIT-I

Hyperledger framework, distributed ledgers, bitcoin, cryptography, Hashing, Application of Blockchain in healthcare, supply chain, finance, energy.

Case Study: Hyperledger Fabrics

### **UNIT-II**

AI through deep learning method, Artificial intelligence as a service, Neural network like CNN, RNN, auto-encoders for applications, Blockchain ecosystem such as classification, regression, image recognition, detection, recommendation & natural language processing. Case Study: Blockchain Ecosystem

### **UNIT-III**

Blockchain can optimize the GPU for Better AI Services, ATOZ, DeepBrain Chain, singularity NET, Golem, Cortex, SONM, Tatau, iExec.

Case Study: Blockchain GPU

#### **UNIT-IV**

Creating a Blockchain network, Hyperledger framework such as Iroha, Fabric, Sawtooth, Indy, and Burrow.

### **UNIT-V**

AI and DL in Blockchain dataset using AI algorithms & models, AIHPC Blockchain capabilities, predictive and sentiment analysis, AKMA in cryptocurrency, end to end Decentralized Applications on Ethereum patform.

IcfaiTech - CURRICULUM&SYIMABUS, IFHE, Hyderabad

VIOB. Sc (Physics) and B. Tech. (DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

### **Text Books:**

1. Hands-On Artificial Intelligence for Blockchain: Build powerful applications for Blockchain using Machine Learning, by Manish Kumar Saraf, Packt Publishing, 2019.

## **Reference Books:**

1. Kiran Garimella, Peter Fingar and Vint Cerf, "AI + Blockchain" Meghan-Kiffer Press, 2019 Edition

## **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Understand Hyperledger framework and its components.
- Analysis the application of Blockchain in healthcare, supply chain, finance, energy.
- Choose neural network like CNN, RNN, auto encoders for applications.
- Apply AI and DL in Blockchain dataset using AI algorithms & models.
- Develop Case Study for real life scenario in the Industry.

HYDERABAD BUCK

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 195)

B.Sc (Physics) and B.Tech.(DS&AI)

SEARCH CONTROL OF THE CONTROL OF THE

Course No. DC417	DC417 Come Title Dlaslahain midb LaT	L	P	U
Course No: <b>DS417</b>	Course Title: Blockchain with IoT	3	0	3

# **Course Learning Objectives**

- Introduction to IoT and Blockchain
- Creating your own blockchain network with Hyperledger composer
- Installing your own blockchain network with Hyperledger Fabric and composer
- Addressing Food Safety: Building around the Blockchain regulations, Challenges and concerns in the modern Food chain.
- Applications related to IoT, Blockchain and Industry 4.0.
- Understanding the Industry oriented projects through Case Study

#### **Course Contents**

## **UNIT-I**

Understanding IoT and Developing Devices on the IBM Watson IoT Platform, Common business use case of IoT, Technical Elements in IoT, Creating your first IoT solution, the gardening solution, coding the device firmware, creating the backend applications.

### **UNIT-II**

Explaining Blockchain Technology and Working with Hyperledger, introduces you to blockchain and helps you to understand how it works with a ledger to record the history of transactions that provide a permissioned network with known identities. Creating your own blockchain network with Hyperledger composer, installing your own blockchain network with Hyperledger Fabric and composer, addressing Food Safety: Building around the Blockchain regulations, challenges and concerns in the modern Food chain.

### UNIT-III

Designing the Solutions architecture, the business of food, challenges of the process, the process at the food factory, the process at the distribution center, the process at supermarket and stores, the technological approach, front-end applications, IoT-based asset tracking, API/SDK, Software components.

Case Study: Blockchain Smart Home

### **UNIT-IV**

Creating a Blockchain network, concepts and Enumerations, Asset definitions, participants, Deploying and testing the business network for Hyperledger, Manipulating assets via transaction in the Blockchain, generating and exporting participants business cards, defining access control lists, creating the IoT part of the solution, hardware setup, firmware development, End to End Testing, creating a food box transferring the asset to the transporter.

Case Study: Logistics with IoT Blackchain

IcfaiTech – CURRICULUM&SYLLABOS, IFHE, Hyderabad
REGISTRAR

B.Sc (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER POWERATION

(Deemed-to-be-University Under Section 3 or 1956)

REGISTRASH
THE ICEM FOR FIGHER FOUNATION FOR HIGHER FOUNDATION FOU

### **UNIT-V**

The IoT, Blockchain and Industry 4.0, Simplifying Business chain, Developing cloud applications, Reference architecture, serverless computing, The Hyperledger composer Toolkit, The Hyperledger composer REST server, Authentication and multiuser mode, Data source configuration.

Case Study: Blockchain and IoT to provide Smart Parking Tools

### **Text Books:**

1. Hands On: IoT solution with Blockchain, by MaximilanoSatos, Packt Publishing, 2019.

### **Reference Books:**

1. Mayukh Mukhopadhyay, "Ethereum Smart Contract Devlopment" Packt Press, 2018 Edition

#### **Course Outcomes**

Upon successful completion of the course, student will be able to:

- Learn the basics and foundational concepts of IoT and Blockchain.
- Explore the applications and its uniqueness in depth.
- Learn about major tools to develop and deploy Iot with Blockchain.
- Understand Hyperledger and Hyperledger Fabric.
- Develop Case Study for real life scenario in the Industry.

OH \* ICFA

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

## 5. REGISTRATION

The structuring of the courses in terms of lecture hours, lab hours, etc., is done through the timetable for each semester/term. On the first day of the semester/term, every student, whether newly admitted or already on rolls, is required to make his/her own timetable for all the courses for which he/she is permitted to register. The student next completes a process of registration for each of the courses in his/her timetable. It shall be the responsibility of the student to complete his/her registration in person, failing which he/she shall not be permitted to attend classes or use the facilities of the Institute.

# **Eligibility Conditions for Registration**

Every student on the rolls of the institute is required to register for the courses to be taken in the semester. A student is not permitted to register in a semester/term if

- (i) He/she has dues outstanding to the institute, hostel, library or any recognized organ of the institute.
- (ii) His/her results of the preceding semester/term are withheld.
- (iii) He/she has an Incomplete (I) report in the immediately preceding semester/term.
- (iv) He/she has been specifically asked to stay away from that semester.

## **Original Registration**

On the first day of the semester, every student must register for all the courses to be taken in the given semester. The Chairperson, Academic Registration and Counseling Division along with his/her team of registration coordinators, ensures smooth completion of the registration process. After ensuring that there is no default of fee payment, every student is given a randomly generated priority number for registration. The order /queue followed by students for registration are based on the priority number. Every student is provided with a master timetable with the following information: course titles, course codes and units of courses offered in the semester, number of sections for each course, timings and venue, common hour details, tests and examination schedules and faculty names. The student is expected to make his/her own timetable exercising his/her choices while ensuring that the sections of his/her choice are still available and there are no chashes in the timings of different courses. The choices that he/she can exercise will in general be decided by his/her priority number. The

IcfaiTech THE CHAIR FOUNDATION FOR HIGHER FOUCATION

B.Sc (Physics) and B.Tech.(DS&AI)

(Deemed-to-be-University Under Section 3 of 5 19 (CL 1956)

Page | 191

registration process is completed once he/she submits the filled in registration card with

details of courses taken and the same is approved by the Chairperson.

Conditions for registration of Backlog courses

If a student has not cleared a named course (other than electives) mentioned in his/her

semester-wise chart by the time under consideration, then the said course becomes a backlog

course until he/she clears it at the next possible opportunity. During registration, the student

should first register for all backlog courses which are offered in that semester before taking

other courses.

**Provisional Registration** 

A student may be permitted for a provisional registration even if he/she has some outstanding

dues. The student can complete his/her registration with the written permission from the

Director. The dues must be cleared within the stipulated time decided by the Institute. The

provisional registration is subject to cancellation without notice, if the student is found

defaulting after the grace period.

Late Registration

Under exceptional circumstances, a student may be permitted to opt for late registration. The

student should apply to the Director through Chairperson-Academic Registration and

Counseling Division and obtain prior permission for late registration. Late registration is done

on the 8th day of the semester. A student who fails to meet the late registration deadline has

lost the last opportunity to register for that semester. Students are advised to avoid late

registrations as the choice of sections for various courses can be limited by the delay.

Amendment to Registration

The Chairperson-Registration can amend the registration of a student under the following

circumstances:

(i) If the registration of a student in a course is not found to be in accordance with the

regulations, like a student not fulfilling prior preparation conditions or pre-requisite conditions

for a course his/her registration in that course will be cancelled.

HYDERABAD !

(ii) In case of timetable clashes or clashes in tests/examination schedule, the registration is

amended by removing the said course(s) from the students registration card.

## **Substitution of Courses**

## Course substitution can be done when

- (i) Any time within one week from the beginning of the semester, a student requests for substitution of a course in which he/she has already registered, with another course.
- (ii) ACC recommends for substitution of one course with another for a student under its purview.

#### Withdrawal from Courses

- (i) If a student desires to withdraw from a course, he/she may submit a formal application for withdrawal within ten weeks from the beginning of the semester.
- (ii) In exceptional circumstances, a student may be permitted to completely withdraw from all the courses and drop the semester/term when the Director is satisfied with the reasons that warrant the withdrawal.

# **Pre-requisite Courses**

Certain courses have pre-requisite conditions attached to them which the student should have fulfilled before registering in such courses. If a course is a pre-requisite, then the student should have a valid grade, not a report, in the pre-requisite course

### **Prior Preparation**

For certain courses or a group of courses, a specified prior preparation is required. These requirements are described in the following table.

For first degree students:		
IP I for single/dual degree  Normally all courses in the semesters prece IP I for his/her program/composite program.		
IPII/TS for single/dual degree	All named courses of his/her program/composite program, other than TS/IP-II.	
For any other prescribed semester of single / dual degree	All named courses in semesters and terms preceding this set of courses in his/her program /	

<sup>\*</sup> If IP-I is delayed by one year for a student with the permission of the appropriate authority, he/she would be permitted to register for CDC's with prior preparation package not including IP I.

IcfaiTech - CURRICRE GIOSTAN ABUS, IFHE, Hyderabad
THE ICFAI FOUNDATION FOR HIGHER EDITION

B.Sc (Physics) and B.Tech.(DS&AI)

(Deemed-to-be-University Under Section 3 of F

THE REPORT TO ANY TO A HIGHER EDUCATION CONTROL TO A TOTAL TO A STANKING ANY TOTAL T

6. TEACHING AND EVALUATION

**Teaching** 

The objective of classroom education is to awaken curiosity, generate habits of rational

thinking and train students to be independent and face unfamiliar situations. Classroom

instructions help a student to organize and correlate facts, comprehend ideas and to use

knowledge creatively.

**Multi-Section Operations** 

A number of courses offered in the first two years at IcfaiTech are multi-section in operation

and many of these are interdisciplinary in nature. Some of the salient features of multi-section

operation are enumerated below:

• Every course, is conducted by a member of the faculty called an Instructor-in-Charge (IC),

with the assistance of required number of Instructors - who will partner in meeting the full

academic responsibilities and organizational needs of teaching and evaluation.

• The IC with the team of instructors makes a comprehensive plan with respect to the conduct

of the course. The team remains in continuous interaction throughout the semester, to ensure

smooth operation of the course.

• While the style of teaching may vary from instructor to instructor, the team makes all effort

to ensure that the pace of delivery of the content is uniform.

• The question papers, its solutions and detailed break-up of marks for tests/quizzes and other

examinations are prepared by the entire team.

To ensure uniformity in marking, a given question is marked by the same instructor for all the

students registered in the course. All this ensures that the operational aspects including

grading are free from arbitrariness.

Course Handout

For a smooth conduct of a course, the instructors share all the important details of the course,

including assessment scheme with students at the beginning of the semester. This is done

through a 'Course Handout' that provides information like the

• scope & objectives of the coverse

IcfaiTech - CURRICULUM&SY AABUS, IFHE, Hyderabad

B.Scaphysics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed to be University Under Section 3 of the UGC ACT, 1956)

- text books, reference books, and other digital resources like NPTEL, SWAYAM
- content and operational aspects (pace, coverage and level of treatment)
- frequency/duration of classes, credits
- components of evaluation like quizzes/tests (announced or unannounced, open-book or closed-book), laboratory exercises, list of experiments, home assignments and their relative weights
- course outcomes
- attendance policy
- policy on make-up tests
- chamber consultation hours

# **Evaluation Components**

Teaching and evaluation form a coherent function and operate on the basis of mutual understanding and trust at IcfaiTech. All components of evaluation are internal; conducted and evaluated by the Instructors/team of instructors handling the course. The evaluation components are evenly spread out in the semester. Various attributes like spontaneous recall, practical application of concepts, ability to work on their own, competence in conceptualized arguments, aptitude to face unfamiliar situations are put to test. The various components of evaluation that the instructor may employ to evaluate a student are tests, quizzes, seminars, presentations, assignments, projects, laboratory-based experiments etc. The evaluation methods, components and their weights depend on the nature of the course. The suggested components normally include two or three written tests, quizzes, and assignments. The quizzes and assignments are interspersed between the tests. All tests and quizzes are conducted during the common hours without disturbing the normal academic schedule. All test and end semester examinations are conducted as per the schedules announced to the students through Course Handouts. One of the components of evaluation (End-Semester examination) is comprehensive enough to include the entire course and is held at the end of the semester. The written examination normally consists of objective questions, short-answer questions, descriptive-answer questions, problems etc. The pattern and type of questions may vary depending on the nature of the course.

IcfaiTech - CURRICULUM&S III BUS, IFHE, Hyderabad

(Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)

Component	Weights	Duration
Test-I	15%	50 minutes
Test-II	15%	50 minutes
Test-III	15%	50 minutes
Assignments/quizzes/presentations/projects	15%	
End Semester Examination	40%	3 hours

# Evaluation components and their weights for a typical theory course.

# **Evaluation and Feedback on performance**

Just as evaluation is done in a continuous and transparent manner, feedback on performance in the evaluation components is also made available at regular intervals. The answer scripts are promptly evaluated and shown to the students. The performance of the students with reference to the highest, lowest and average marks is discussed in the class. Solutions with the marking scheme are displayed immediately on the department notice board after every test and examination.

In case of any subjectivity in the evaluation, or discrepancy from the discussed/displayed evaluation scheme, or any totaling errors in the answer script, the student reserves the right to request for a rechecking or retotalling.

Mid-semester grading for each course, based on the evaluation components conducted until the middle of the semester, is made available to the students. This grade alert will help the students to improve their performance in the remaining evaluation components.

## **Attendance Policy**

Every student is normally expected to maintain a minimum of 75% attendance in every course for which he/she is registered. In courses with both theory and laboratory components, the student must maintain a minimum of 75% attendance in both the components.

The IC/instructor in consultation with the Chairperson Academics can recommend to the Director, IcfaiTech for condonation up to a maximum of 10% for those students who face genuine difficulty in maintaining 75% attendance.

HYDERABAD

Condoning process has the following steps

IcfaiTech - CURRICULUM&SYLLABOS, LEHE, Hyderabad



Page | 196

• Instructor-in-Charge/instructors make a list of students with attendance between 65 and

75%.

• The data of these students on performance indicators like marks in tests, quizzes and

assignments is examined.

• Assignments and tasks are designed for each student to make up for deficiency in academic

performance and the shortage of attendance.

• who complete the task to the satisfaction of the Instructor are permitted to appear for the

examination.

If a student does not write the end-semester examination or is not permitted to take the end-

semester examination in any course, he/she will be given RRA report. He/she will be required

to Register Again (RRA) for the course when it is next offered.

Periodic alerts given by the instructors regarding attendance must be taken seriously and every

effort made to reach the required attendance.

Make-up Policy

If a student anticipates a genuine difficulty in meeting the date of component of evaluation,

he/she should take the IC/Instructor into confidence prior to the event and request for a

makeup. Whenever a student misses a component of evaluation for genuine and unanticipated

reasons and has therefore not taken prior permission, the student must immediately after the

test approach the IC/Instructor with a request for make-up.

If the IC is satisfied with the request, a make-up test/examination would be conducted one

week after the date of the missed component of evaluation.

The students must note that there will be no makeup for laboratory experiments, lab exams,

quizzes and presentations.

**Unfair Practices in Examinations/Academics** 

Students must not resort to unfair means during any evaluation component. Any of the

following events will be considered as unfair practice(s) during examinations/evaluation.

a) Possessing unauthorized materials like notes or slips in pockets. Manity bags and purses.

IcfaiTech - CURRICULUM&SYLLAB IFHE, Hyderabad

and B.Tech.(DS&AI)

- b) Having notes and formulas written on the body.
- c) Using cell phones or programmable calculators.
- d) Copying from other students.
- e) Allowing/enabling other students to copy from one's paper/computer screen.
- f) Taking or giving any kind of assistance from/to other students.
- g) Communicating with the students in or outside the exam hall.
- h) Going out of the examination hall other than to the rest room.
- i) Plagiarism in project work/assignments.

In the judgement of the Invigilator, if a student has indulged in unfair means in the examination hall, the following steps are taken by the invigilator:

- The student is asked to surrender the answer book and any possible material evidence and leave the exam hall.
- A report is filed with the Director, IcfaiTech after handing over the answer book with material evidence. The examination committee conducts an enquiry where the student is given opportunity to defend himself.

Use of unfair means if established, would result in one of the two punishments:

- a. Cancellation of registration (RC) for the course in which use of unfair means was established.
- b. Cancellation of registration for the course along with suspension for a full semester. Suspension for a full semester implies that the student cannot register for any course offered in that semester.

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

### 7. GRADING

The IcfaiTech system emphasizes on continuous and regular evaluation, which includes numerical marking in grading the student. At the end of a semester, letter grades are awarded to the students based on their overall performance in the course. These grades are relative to the performance of all the students evaluated for that course.

### **Letter Grades**

The list of letter grades, the grade points associated with them and their qualitative meanings are given below:

Letter	Qualitative Grade	Points attached
A	Excellent	10
В	Good	8
С	Fair	6
D	Poor	4
Е	Exposed	2

In order to arrive at letter grades, the histogram based on the total marks in a particular course for all the students pursuing the course is made. The histogram normally shows clusters, gaps between clusters or dips between clusters. The grading in the course is guided with reference to the highest, lowest, average marks, and the gaps and dips between clusters of students. In courses where the registered number of students runs into hundreds, the range of C grade usually covers the average marks. This may however not be case when the histogram is skewed, and the average marks of the class is unusually high or low.

In case of absence of clear gap between clusters, the grade border may be drawn in a dip in the cluster. The decision on whether the students appearing on the borderline are pushed to the higher grade or to the lower grade is taken on a case by case basis. Some of the factors that guide the instructor in grading the borderline students are attendance, participation in the class and overall attitude.

In courses with a small number of registered students, the instructor opts for absolute grading. In such cases, the instructor announces to the students at the beginning of the semester, the anticipated mark ranges for various grades.

IcfaiTech - CURRICULUM&SYLLABUS JFHE, Hyderabad

.

(Physics) and B. Tech. (DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
Deemed-to-be-University Under Section 3 of the UGC ACT, 195

Reports

At the time of final grading, in certain cases, the Instructor-in-Charge can report certain

events/facts in place of letter grades. These reports are not to be construed as grades. The

various reports listed below are elaborated in the subsequent paragraphs.

1. Incomplete (I)

2. Grade Awaited (GA)

3. Withdrawn (W)

4. Registration Cancelled (RC), Required to Register Again (RRA) and Discontinued from the

Program (DP)

5. Not Cleared (NC).

Incomplete (I)

An Instructor-in-Charge who finds that a student has not fulfilled some requirement of a

course before the deadline for transmitting the grades, is satisfied that the student is able to

transmit a grade or a report without this fulfillment; can use his/her discretion to give the

student an opportunity.

The Instructor-in-Charge can within the deadline, send a report 'I' (Incomplete) for the

student and also inform the student of the same. It shall be the responsibility of the student to

contact the Instructor-in-Charge and fulfill the requirement for replacement of the 'I' report

within two weeks after the end of the semester; failing which the Instructor-in-Charge will

communicate whatever grade/report is possible for that situation.

Grade Awaited (GA)

'GA' is given in situations where operational and practical difficulties may cause a delay in

transmitting of a grade or a report. Some instances when GA is given are as follows:

(i) pending case of unfair means

(ii) pending case of indiscipline

(iii) for IP courses where the student is at an office ampusement and the dissemination of

information between the Institute and the Ir/center is delayed

BSc (Physics) and B.Tech.(DS&AI) IcfaiTech - CURRICULUM&SYLLABUS, IFIAE, Hyderabad

Page | 200

(iv) if due to genuine reasons a student is unable to appear for end-semester examination on

the scheduled date and his/her request for make-up has been granted After the case has been

decided, or the IP grade getting transmitted or the makeup taken and evaluated, the GA report

is converted into a valid grade or report.

Whenever the report GA appears in the grade sheet, it must be converted into a letter grade or

a report before the next semester registration.

Withdrawn (W)

A student may seek withdrawal from course(s) in a semester for any of the following reasons:

(i) The student is unable to attend classes for the course(s) for a genuine reason.

(ii) The student is unable to cope up with the normal load and withdraws from the course(s) to

reduce his/her academic load for the semester.

Request for withdrawal should be made to Chairperson-Academics, within ten weeks of

commencement of the semester. In case of withdrawal within the stipulated time, the grade

sheet/transcript of the student will indicate 'W' (withdrawn) against the course(s) from which

the student has withdrawn his/her registration. If the withdrawal is made after the due date, the

event will be reported as 'RC'. In either of the situations, the student will have to register for

the course(s) at the next offer and obtain a valid letter grade.

Registration Cancelled (RC), Required to Register Again (RRA), Discontinued from

Program (DP)

If a student's registration for a course has been cancelled, it will be reported in the grade

sheet as 'RC'. The following are the situations when an RC report is issued:

(i) Cancellation is recommended as a part of disciplinary action against the student for

resorting to unfair means during examination or other unprofessional behavior

(ii) Cancellation is recommended due to less than the minimum required percentage of

attendance.

(iii) Cancellation is recommended if a provisionally admitted student fails to submit the proof

of necessary documents required for registration and/or does not satisfy the minimum

eligibility requirements for the admission within the prescribed time had

IcfaiTech - CURRICULUM&SYLLABUS, IFHE, Hyderabad

B.Se (Physics) and B.Tech.(DS&AI)

THE ICFAI FOUNDATION FOR HIGHER EDUCA Deemed to be University Unider Section 3 of the UGC ACT, 1

(iv) Cancellation is recommended when a student persistently and/or deliberately does not pay his/her dues.

RC itself has many contextual meanings:

- (i) When it is clearly known that the student is required to register again in the same course, the event will be reported as RRA (Required to Register Again).
- (ii) If RC amounts to discontinuation from the program, it will be reported as DP (Discontinued from the Program).
- (iii) If the cancellation of registration is not reported either as RRA or as DP but as RC, it does not necessarily mean that it is free from any constraint but that the meaning of the constraint must be construed from the context in which the RC is reported.

# Not Cleared (NC)

If a student continued to remain registered in a course (with or without lab component) but gave the instructor inadequate opportunity to evaluate him by not attending the quizzes/tests/examinations/lab sessions and other components of evaluation, or by appearing in the same for the sake of appearing, without applying himself to the task at hand, the student will be given NC (Not Cleared). It is to be noted that a NC cannot be ignored, except under the situations described in (ii) and (iii) below:

- (i) Whenever a student gets a NC report in a course which is in the compulsory package of his/her program, he/she is required to register again in the same course and get a valid grade.
- (ii) If a student has a NC report in an elective course, he/she can either repeat the course to get a valid grade or ignore it to choose another course. However, a student must get valid grades in at least the prescribed number of electives in his/ her program.
- (iii) If a student record has a NC report in a course which remains unaccounted for, after a process of transfer has been completed, although it will not be possible for him/her to wipe out the NC report from his/her transcript, he/she can still graduate. (iv) If a student gets a NC in IP/Thesis, he/she will be required to register in the same for one more semester.

HYDERABAD

lcfaiTech - CURRICULUM&SYLLABUS, IFFE, Hyderabad

B.Sc (Physics) and B.Tech.(DS&AI)

REGISTRAR
THE ICFAI FOUNDATION FOR HIGHER EDUCATION
(Deemed to be University Under Section 3 of the UGC ACT, 1956)

# **Cumulative Grade Point Average (CGPA)**

The Cumulative Grade Point Average (CGPA) is used to describe the overall performance of a student in all courses in which he/she is awarded letter grades since his/her entry into the Institute. It is also used for the declaration of division when the program is completed.

CGPA is the weighted average of the grade points of all the letter grades received by the student from his/her entry into IcfaiTech and is computed as follows:

CGPA = 
$$\frac{\sum u_{i}g_{i}}{\sum u_{i}} = \frac{(u_{i}g_{i} + u_{2}g_{2} + u_{3}g_{3} + ...)}{(u_{i} + u_{2} + u_{3} + ....)}$$

Where u1, u2, u3, ............ denote units associated with the courses taken by the student and g1, g2, g3.......... denote grade points of the letter grades awarded in the respective courses. Reports will not alter the CGPA, since the same are not accounted for in the CGPA calculations.

When a student repeats a course in which he/she has already received a grade, as soon as a new grade is obtained, it will replace the earlier one in the calculation of CGPA. It is to be noted that only the latter grade in a course would be considered for the calculation of CGPA and not the better of the two grades.

# Grade Sheet

A student's grades, reports, CGPA, etc., at the end of every semester/term will be recorded on a grade sheet, a copy of which will be issued to him/her. The grade sheet will be withheld when a student has not paid his/her dues or when there is a case of breach of discipline or unfair means pending against him/her.

While registration with approval of the appropriate authority is a token of permission to pursue studies, the grade sheet is a complete record of the outcome of what was intended in the registration. The various grades and reports discussed in the handbook will be appropriately used to tally the grade sheet with the registration data. It would be evident that this tally between what was registered for and what was obtained in terms of grades and reports will apply to all courses except for any course which was originally registered for, but subsequently replaced by another course through substitution.

IcfaiTech - CURRICULUM&SYLLABUS, FHE, Hyderabad

B.Sk (Physics) and B.Tech.(DS&Al)

HYDERABAD

THE ICFAI FOUNDATION FOR HIGHER EDUCATION
Deemed to be University Under Section 3 of the U

Page | 203

The tally is made on a course by course basis at the end of the term to determine which of the

courses have been cleared. A course is deemed to have been cleared if the student obtains a

grade in the course. However, mere clearing of the prescribed courses does not tantamount to

fulfilling the requirements of graduation.

While all grades secured, reports and other pertinent information for a semester are given in a

grade sheet, the chronologically organized information from the grade sheets of a student with

necessary explanation constitutes his/her transcript, which is issued at the time he/she leaves

the institute or on request at an intermediate point.

**Minimum Academic Requirements** 

The education philosophy of IcfaiTech interlinks and at the same time distinguishes between

the performance of a student in a single course and his/her cumulative performance.

Accordingly, the student of the first-degree program has to maintain the expected minimum

academic requirement at the end of each semester.

They are as follows:

(i) A student should not have secured more than one 'E' grade in the semester.

(ii) A student should have CGPA of at least 4.50.

(iii) A student should have at least cleared with his/her latest performance, such courses

(counted from the point of his/her entry into the Institute) as are prescribed for a period that

corresponds to two-thirds of the number of semesters spent by him/ her since his/her entry

into the Institute with reference to his/her current program. This means that at any stage of

reckoning, the student should not have spent more than 50% extra time than what is

prescribed for him/her up to that stage.

**Academic Counseling Committee (ACC)** 

The minimum academic requirements that every first-degree student should meet at the end of

every semester are mentioned above. Failure to meet even one of these requirements will

automatically bring the student under the purview of the ACC or the designated authority.

The ACC will take immediate charge of the student and ask him/her to follow a specific path

so that he/she can be rehabilitated at the earliest. The student under ACC will not undergo

HYDERABAD

IcfaiTech - CURRICULUM&SYLLABUS, IVIII, Hyderabad NO

Page | 204

normal registration process but will be guided by the ACC in selection of the courses for the

semester registration.

Once a student has been placed under the purview of the ACC, he/she should continue to be

under its direct guidance until, ACC after being satisfied with his/her overall progress and

performance, declares him/her to be outside its purview. All decisions of the ACC shall be

final.

Students under the purview of ACC are cautioned from time to time if they fail to improve in

the following stages.

Warning: A student, who comes under the purview of the ACC for the first time due to a

CGPA between 4.2 and 4.5 is warned to take studies seriously and improve the performance

in order come out of ACC list by the next semester.

Severe Warning and Reduction in Course Load: If a student has CGPA between 3.0 and

4.2 or continues to remain under the purview of the ACC in the subsequent semester, he/ she

would be severely warned. The ACC, based on its evaluation of the student, decides that the

student would not be able to cope up with the normal load of courses for the semester. The

ACC will work out a package of courses with reduced load for the ensuing semester, so that

the student gets a chance to improve and come out of the purview of the ACC.

The implication of a reduced load is that the period of study gets extended.

**Probation:** If the advice and guidance of the ACC is not taken seriously by the student, and

he/she continues to give deteriorating performance, he/she might be given a last chance and

kept on probation during the next semester. During this semester his/her progress will be

closely monitored.

Discontinued from Program: If a student on probation during a semester fails to improve

his/her performance to the satisfaction of the ACC and his/her CGPA falls to below 3.0, he/

she would be Discontinued from the Program (DP) and would be asked to leave IcfaiTech.

It must be noted that any student under the purview of the ACC found to be involved in any

act of indiscipline or unfair means in examination at any time would be immediately asked to

discontinue from the program. It should therefore be the single-minded objective of the

student to fulfill the minimum academic requirements stipulated this enabling himself/herself

to be declared outside the purview of the ACC at the darliesterness

IcfaiTech - CURRICULUM SYLLABUS, IFHE, Hyderabad

B.Sc (Riverics) and B.Tech.(DS&AI)

# **Graduation Requirements**

A student is deemed to have fulfilled the requirement of graduation for the first-degree program when he/she satisfies the following conditions-

- (i) Has cleared all the courses prescribed for him/her in his/her program.
- (ii) Has obtained a minimum CGPA of 4.5.
- (iii) Has remained outside the purview of the ACC or has been declared outside its purview.
- (iv) Has overcome all the consequential stipulations of an NC report; except where there is NC report in an elective course over and above the prescribed number of elective courses or in a course which has ceased to be a part of his/her current program because of transfer of program.

A student is deemed to have become eligible for the Bachelors degree if, in addition to the above requirements he/she has no case of indiscipline or unfair means pending against him/her. If a student has outstanding dues against him/her to be paid to IcfaiTech, the student hostel or any other recognized affiliate/ associate organization of IFHE, his/her degree will be withheld until the said dues are cleared.

### Certification

The following classification based on CGPA will be made and mentioned in the graduation certificate of the first Degree program student.

Distinction	CGPA 9.00 or above
I Division	CGPA 7.00 or more but less than 9.00
II Division	CGPA 4.50 or more but less than 7.00

Every student is expected to familiarize himself with the following documents associated with academic progress and program completion: Grade Sheet: Grade sheet is a complete record of courses done, grades obtained by the student, showing GPA and CGPA and other information for a semester. Students can obtain duplicate copies of grade sheet on payment of nominal fee.

HYDERABAD

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 195/

**Transcript:** Transcript is chronologically organized information of courses, grades, GPA, CGPA obtained in various semesters during the Program which is issued on successful completion of the Program. Students can obtain additional transcript on payment of `nominal fee. Provisional Certificate: Students who fulfill the graduation criteria will be given a provisional certificate before the convocation.

# **Degree Certificate:**

Students who fulfill the graduation criteria will be awarded the Degree certificate at the formal convocation.

### **Awards**

All students who successfully complete the prescribed course work and examinations will receive their degree from IFHE.

Gold and Silver medals will be awarded to the students scoring the first rank and second rank respectively on completion of the program. A student against whom disciplinary action has been taken or has any backlog of course(s) will not be eligible to get merit scholarship/medals.

THE ICFAI FOUNDATION FOR HIGHER EDUCATION (Deemed-to-be-University Under Section 3 of the UGC ACT, 1956)



