Bharath
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
Declared as **Deemed-to-be-University** u/s 3 of the UGC Act, 1956

B.Tech Information Technology

Curriculum and Syllabus Regulation 2020

Bharath
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed - to - be - University under section 3 of UGC Act 1956)

ACADEMIC REGULATIONS – 2020

Bachelor of Technology (B.Tech. – Four Years)

(Choice Based Flexible Credit System)

Academic Year 2020-21

I. Regulations for B.Tech. (Common to all Programmes)

These regulations are applicable to the students admitted from the Academic Year 2020-21 onwards. As per the recommendation of National Knowledge Commission, University Grants Commission (UGC) and All India Council for Technical Education (AICTE), institutions of higher education need to carry out academic reforms in all areas including admission policy, uniform academic calendar, introduction of Choice Based Flexible Credit System, continuous assessment and grading system. In keeping with these recommendations, Bharath Institute of Science and Technology (BIHER) had adopted the Choice Based Flexible Credit System (CBFCS) in the faculty of Engineering and Technology in the year 2015 which was improved upon in 2018 and now it is being further refined and implemented from 2020-21 onwards.

Preliminary Definitions and Nomenclature

In these regulations, unless the context otherwise requires:

i. **'Degree'** means that academic award conferred upon a student on successful completion of a four-year programme designed to achieve the defined attributes. It is referred to as Under-Graduate (UG) Degree, that is "Bachelor of Technology" also known as "B.Tech. Degree".

ii. **'Programme'** means cohesive arrangement of courses, co-curricular and extracurricular activities to accomplish predetermined objectives leading to the awarding of a degree. It also means branch or discipline of B.Tech. Degree programme like Civil Engineering, Mechanical Engineering, etc. Some Degree programmes also provide options to specialize in a specific domain of interest. Such B.Tech. Degree programmes are titled as the *Degree along with its specializations* like Biotechnology with specialization in Regenerative Medicine, etc.,

iii. **'Course'** means a combination of theory, tutorials and practice sessions of a subject studied in a semester, like Mathematics, Physics, etc.,

iv. **'Minor'** is an optional secondary concentration of courses that often complements the Degree Programme.

R.1.0 Admission for B.Tech. (Regular) Programme

R 1.1 **Number of Seats:** The number of seats in each branch of the B.Tech. programme for which admission is to be made in the Faculty of Engineering and Technology will be decided by the Board of Management, BIHER.

R 1.2 **Minimum Eligibility:** The minimum eligibility for Admission to B.Tech. degree programmes (Regular) shall be based on the following two essential criteria:

(a) A pass in the 10+2 (Higher Secondary) examination or any other equivalent examination of any authority, recognized by BIHER, with a minimum aggregate of marks in Mathematics / Biology / Biotechnology, Physics and Chemistry to be specified by the Admissions Committee.

(b) Qualification in BIHER Entrance Examination - Engineering (BIHEREEE) (or) any other Entrance Examination conducted by central/state entrance examination body for the purposes of admission to an engineering degree programme for the

respective year of admission.

R 1.3 **Eligibility for BIHEREEE:** The eligibility for appearing for BIHEREEE and the format shall be mentioned in the Application form and would be decided by the Admissions Committee for the respective year of admission.

R 1.4 **Seat Allocation and Admission:** The Admission Committee will prepare a merit list based on the marks scored by the candidates in the BIHEREEE and call the applicants in the merit order for counselling. Seats are allotted based on applicant's interest and seat availability. Only those candidates who have scored the minimum aggregate of marks as specified in R.1.2 (a). will be included in the merit list.

R 1.5 **Admissions under Lateral Entry Scheme:** Under the Lateral entry scheme of Admissions, the following categories of candidates are eligible for admission directly to the 3rd semester of any B.Tech. programme offered by BIHER.

Minimum Eligibility: A pass in Diploma in Engineering/Technology through:

(i) A minimum of three years of institutional study, after the 10th (SSLC) examination, recognized by BIHER. (or)

(ii) A minimum of 2 years of institutional study, after the 10+2 (Higher Secondary) examination, recognized by BIHER. (or)

(iii) A Bachelor's degree in Mathematics/Physics/Chemistry, after the 10+2 (Higher Secondary examination, recognized by BIHER. (or)

(iv) Any other equivalent degree through a minimum of 3 years of institutional study, after the 10+2 (Higher Secondary) examination, recognized by BIHER.

R 1.6 **Medical Standards for Admission**: Candidates have to fulfil the medical standards required for admission as set out by the Admission Committee.

R 1.7 **Fees for Admission:** The selected candidate will be admitted to the B.Tech. programme after he/she fulfils all the admission requirements as indicated in the letter of admission after making the payment of the prescribed fees within the due date announced.

R 1.8 **Authority for Admission:** Any matter related to admission to the B.Tech. programme, the decision of the Admission Committee is final.

R 1.9 If, at any time after admission, it is found that a candidate has not fulfilled the requirements stipulated in the offer of admission, the Dean(Engg) may revoke the admission of the candidate and report the matter to the Vice Chancellor.

R 1.10 In Addition to the above, admissions will be based on the rules and regulations of the UGC/Competent authorities in force at the time of admissions.

R 1.11 **Academic Calendar:** All B. Tech Programmes would be conducted only on an Academic Calendar (typically starting June / July of a year to March / April in the subsequent year).

R.2.0 Structure of B.Tech. Programme (Common to all Programmes)

R 2.1 **List of Programmes:** The B.Tech. Degree Programmes offered by BIHER are as follows:

1	Aeronautical Engineering (AE)
2	Aerospace Engineering (AS)
3	Automobile Engineering (AU)
4	Biomedical Engineering
5	Biotechnology (BT)
6	Biotechnology with specialization in Agriculture (RM)
7	Biotechnology with specialization in Genetic Engineering (GE)
8	Civil Engineering (CE)
9	Computer Science and Engineering (CS)
10	Computer Science Engineering with specialization in Artificial Intelligence (AI)
11	Computer Science Engineering with specialization in Cyber Security (SC)
12	Electrical and Electronics Engineering (EE)
13	Electronics and Communication Engineering (EC)
14	Information Technology (IT)
15	Mechanical Engineering (ME)
16	Mechatronics Engineering (MH)

R 2.2 **Category of Courses:** The Programme of study will consist of 8 categories of courses distributed over eight semesters (6 semesters for lateral entry students) with two semesters per year as listed below:

No.	Category Code	Course Category
1	H	Humanities and Social Sciences including Management courses
2	B	Basic Science courses
3	S	Engineering Science courses
4	C	Professional Core courses (Compulsory courses)
5	E	Professional Elective courses (Optional courses relevant to chosen branch/specialization)
6	O	Open Elective courses (Optional courses from other technical and/or emerging subjects)
7	P	Project Work, Seminar and Internship in industry or higher institutions
8	M	Mandatory Courses (non-credit courses)

R 2.3 **Outcome Based Education:** The B.Tech. programmes follow the Outcome Based Education (OBE) guidelines and have well defined:

1	Program Educational Objectives (PEO)
2	Program Learning Outcomes (PLO) which includes Program Specific Outcomes (PSO)
3	Mission of the Department to Program Educational Objectives (PEO) Mapping
4	Program Educational Objectives (PEO) to Program Learning Outcomes (PLO) Mapping
5	Structure of Undergraduate Engineering Programme
6	Categorization of Courses (for all four years)
7	Program Articulation Matrix (for all four years)

And, every course has well defined:

1	Course Learning Rationale (CLR)
2	Course Learning Outcomes (CLO) – (Outcome based Objectives)
3	Learning Plan with session-wise Session Learning Outcomes (SLO)
4	Learning Assessment Scheme
5	Course Designer Details

These details are proposed by the respective Board of Studies and approved by the Academic Council.

R 2.4 **Learning Curriculum:** B.Tech. Programmes have a learning curriculum comprising of appropriate combinations of learning from Theory, Tutorials and Practice sessions.

R 2.5 **Learning Credits:** Learning Credits are earned by the learner based on the following pattern:

Learning Environment	Learning Credit (C)
1 Hour* Learning from a Lecture Session per week (L)	1
1 Hour* Learning from a Tutorial Session per week (T)	1
1 Hour* Learning from a Practice Session per week (P)	0.5

(* 1Hour of Learning is usually a 50-60 minute period)

R 2.6 **Minimum Learning Credits for the award of Degree:** For the award of B.Tech. Degree, a student has to acquire a maximum of 160 learning credits by learning and practicing the various courses prescribed in the curriculum within the stipulated time duration.

(a) **Learning Credit Requirement for Lateral Entry Students:** For the award of B.Tech Degree for a student who has joined through the Lateral Entry Scheme, the number of learning credits to be acquired will be in accordance with the curriculum of the program concerned and the credit standing at the point of entry (Second year, third semester) to the B.Tech. program.

For instance, assuming the total credits stipulated for a particular specialisation of first year B.Tech. is 42, and the aggregate of bridge courses – mathematics (2 credits), Physics (2 credits) and Chemistry (2 credits) is 6 credits, then the credit standing would work out to 42-6= 36 credits. In this case the student, has to earn [160 – 36 = 124 credits, including the credits of bridge courses to receive his/her B.Tech. degree.

Lateral entry students, on admission, shall have to undergo 'Bridge Courses' prescribed by the BIHER, which they have to pass and the learning credits acquired from these courses are added towards their qualifying degree requirements.

R 2.7 **Classification and Numbering of courses:** The 9 digit Course Code Structure is provided below:

For Example : U20ECCT03

L YY DD C A SS					
L	YY	DD	C	A	SS
1 digit	2 digits	2 digits	1 digit	1 digit	2 digits
Level of the Course	**Year of Regulation**	**Course Offering Department**	**Type of Course**	**Additional Qualifier**	**Serial No. of the Course**
U- UG P-PG	Regulations 2020	LE – English PY – Physics CY – Chemistry MA – Mathematics MB – Management Sciences PD – Career Development Centre AS – Aerospace Engineering AU – Automobile Engineering BT – Biotechnology CE – Civil Engineering CS – Computer Science & Eng., EE – Electrical & Electronics Eng., EC – Electronics & Commn. Eng., IT – Information Technology ME – Mechanical Engineering MH – Mechatronics Engineering	**H** – **H**umanities, Social Sciences including Mgt. Courses **B** – **B**asic Science Courses **E** – Engineering **S**cience Courses **C** – Professional **C**ore Courses **S** – Professional **E**lective Courses **O** – **O**pen Elective Courses **P** – **P**roject Work, Seminar, Internship etc., **M** – **M**andatory Courses (non-credit)	T - Theory L - Laboratory I - Industry B - Bridge J - Joint	01 02 etc.,

R 2.8 **Medium of Instruction:** The medium of instruction, examination and project reports will be in English.

R.3.0 Registration / Enrolment for Courses

The process of signing-up for courses is called 'Registration'. Students are enrolled after they pay the prescribed fees. For a student to attend classes he/she has to necessarily complete both registration and enrolment. All students shall formally register for the courses every semester to undergo their learning course work.

R 3.1 **Course Enrolment Requirements:** Enrolment for all courses prescribed as per the

curriculum is mandatory.

(a) Registration of any course will be controlled by the respective Heads of Department.

(b) The registration sheet contains the course code, course title, number of credits earned till date, number of credits opted for the current semester, and the remaining number of credits to earn for the award of the degree. The student will make the choice of courses on his own or in consultation with his/her Faculty Advisor.

(c) For the first semester (and III semester in the case of lateral entry students) registration shall be completed within a week prior to the commencement of classes.

(d) For all other semesters, the registration will be done during a specified week immediately after the end semester examination of the previous semester.

(e) Late enrolment would not be encouraged. In case of a late enrolment, special permission is required from the respective Heads of Department and should be done not later than two weeks from the commencement of classes.

R 3.2 **Break in Studies:** A student will not be allowed to enrol for current semester and has to undergo a year of break in studies if he/she:

(a) Does not have a minimum of 75 % attendance in at least 3 or more courses in the previous semester

(b) Has not cleared any pending fee dues to BIHER, Hostel, Library, NCC etc., in the previous semester

(c) Has been 'Debarred from study' due to any stipulated reason in the previous semester.

(d) Has any 'Pending Disciplinary Actions' against him/her from the previous semesters

R 3.3 **During the Break of Studies**, a student:

(a) Cannot attend any regular classes

(b) Will not be permitted to stay in the 'Hostel' facility provided by BIHER

(c) Will not be permitted to participate in any of the BIHER's activities inside the campus.

(d) Can register for 'Compensatory courses' for such courses in which he/she might have obtained an 'I' grade.

(e) Can reappear for the 'End Semester Final Examination' for such courses in which he/she might have obtained 'F' / 'Ab' / 'I' grade.

R 3.4 **Enrolment After Break in Studies:** A student who undergoes a break in studies in the current semester (odd/even) can 'Enrol Back to Study' into the B.Tech. Programme only in the subsequent corresponding (odd/even) semester in the next academic year only. And 'Enrol Back from Study' is subject to the approval from Dean (Engg.).

R 3.5 **Detention in Courses and Compensatory Courses:**

The system of compensatory courses is meant only for those students who are unable to cope up with the academic vigour and hence fails to secure 75% attendance in a few courses in a semester. Such students can not appear for end-semester final examination

for those courses in which their attendance percentage is less than 75% and are deemed to be detained in such courses and awarded 'I' grade in the same (Refer R. 8.3). However, such students can register under Compensatory Courses in the next semester subject to the following conditions:

(a) Compensatory courses are conducted only for a student who is 'Detained from Study' due to lack of attendance of 75% minimum.

(b) Compensatory courses may be announced after the publication of results, by the respective School/Department, by the Deans/HODs, with the approval of the Dean(Engg)

(c) Student has to register for the Compensatory Course and pay the prescribed fee for the Compensatory Courses within the specified time limit.

(d) A maximum of two Compensatory Courses alone will be permitted to be registered by a student during the semester next to the semester of detainment.

(e) Withdrawal from Compensatory courses is not permitted

(f) These Compensatory courses will be conducted only for 75% of the hours prescribed in the curriculum and would be held either during weekends or in evenings after the regular class duration.

(g) A student has to obtain a minimum of 75% attendance in each of these courses.

(h) There will be only one end-semester final examination, and no continuous learning assessments. The internal marks scored earlier in the detained course will be ignored.

(i) A student has to score the minimum passing criterion to be declared 'Pass' in that course.

(j) Students cannot demand a compensatory course for a course in any semester as a matter of right. Compensatory courses will be conducted subject to availability of faculty, class rooms and logistics.

(k) Students who have done a Compensatory Course will not be considered for rank, medal or distinction.

(l) Compensatory Courses are not conducted only for those courses that have an end-semester final examination and would not be conducted for those courses that have only Continuous Learning Assessments and no final examination component. In case a student has a lack of attendance (less than 75%) in a course that does not have a final examination component, then the student has to redo the course in the respective department in the subsequent semester.

R 3.6 **Adding and dropping courses:** This is applicable only to Professional Elective and Open Elective courses.

(a) A student may withdraw from an elective course without academic penalty only during the first 2 weeks of the semester only.

(b) A course having a Co-requisite course will not be permitted to be dropped. Similarly registering for a new elective course is permitted only during the first two weeks of the semester.

(c) If an elective course is dropped within the first two weeks of the commencement of classes, it does not appear on the academic transcript. In case, the course is dropped any time after 2 weeks unilaterally by the student, for reasons whatsoever, it will be recorded with a mark of "Ab" or "I"

(d) When a course is added within the permissible timeframe, the attendance will be calculated from the date of registering the newly added course. No make-up classes need be conducted for the individual student to compensate for the missed classes.

(e) **Registration in graduate level courses by undergraduate students:** Exceptional undergraduate students who are in the fourth year of study and who possess CGPA of not less than 9.0 may enrol in a graduate (Masters) course. In order to do so, students must receive a strong recommendation from the academic advisor and prior approval of the Dean (Engg.). The according of approval lies solely with the Dean (Engg.). In any case only ONE master's level course will be permitted. The assessment procedure will remain the same as applicable for the master's level course.

R.4.0 Maximum and Minimum Duration of the Programme

R 4.1 **Semester Duration:** Each semester of study shall normally consist of 90 working days or 450 hours inclusive of end-semester final examinations. A student is ordinarily expected to complete the B.Tech. programme in eight semesters for regular programme and in 6 semesters under lateral entry scheme. However, a student may complete the programme at a slower pace by taking more time as specified below:

Regular students: within the time duration of 12 semesters (As per the UGC Norms) for students admitted in a particular year.

Lateral Entry students: within the time duration of 10 semesters (As per the UGC Norms) for students admitted in a particular year.

The above-mentioned time duration is counted excluding semesters withdrawn on medical grounds etc. R 4.2 In compliance with the rules and norms of UGC, no student will be allowed to complete the B.Tech.
degree in less than 8 full-semesters.

R.5.0 Temporary withdrawal from the programme

R 5.1 A student may be permitted by the Dean(Engg.) to withdraw from the programme for a semester or longer for reasons of ill health or other valid reasons. Normally a student will be permitted to discontinue from the programme only for a maximum continuous period of two semesters or the aggregate of individual discontinuation not exceeding two semesters.

R.6.0 **Academic Advising :** In order to provide academic assistance and individualized attention to students, different levels of advising/attention will be provided by three types of officers.(1) Academic Class Advisors (2) Student Counsellor (3) Faculty Advisors

R 6.1 **Academic Class Advisors:** For every 60 to 70 students, an Academic Class Advisor would be allocated to help the student evaluate and realize educational and career options. The basic responsibilities of the Academic Class Advisor are:

(a) To assist the student in career planning and to refer student to campus resources for such assistance.

(b) To be knowledgeable about the program(s) for which he/she is advising and be familiar with published academic rules and regulations of BIHER.

(c) To inform the student of the various aspects of degree requirements.

(d) To approve the course registration of the student at the department level

(e) To consider and approve the application for adding / dropping / auditing of courses

(f) To guide the students while applying for readmission / transfer etc.

(g) To help student plan a suitable schedule of classes, at least one semester in advance.

In all of these matters, the Academic Class Advisor or the advisement team must judge whether the student's request is in order, is in the student's best interest, and is feasible under existing regulations.

R 6.2 **Student Counsellors & Faculty Advisors:** In order to motivate the students personally and provide counselling on academic and non-academic matters, a faculty member called Student Counsellor shall be assigned for every 25-30 students. In addition, Faculty Advisors also would advise students time to time.

R.7.0 Conduct and Discipline

R 7.1 **Expected Conduct and Discipline:** Every student is required to:

(a) Demonstrate ethical, professional and exemplary conduct and decorous behaviour both inside and outside BIHER campus and not to indulge in any activity that will tend to bring down the prestige of the BIHER.

(b) Be self-motivated and to be self-disciplined

(c) Make the most of their ability and to contribute to the happiness and well-being of BIHER community by supporting others.

(d) Treat others in the way that they would wish to be treated themselves

(e) Abide by the orders of the Honourable Supreme Court of India, and not to get involved in any acts of ragging in any form. Ragging is absolutely and completely prohibited in BIHER.

(f) Avoid Plagiarism, cut and paste jobs, malpractices of any kind in learning assignments including project work and its reports.

R 7.2 **Act of Indiscipline:** A student who does not conduct in the manner expected and as stated above is considered to be performing an act of Indiscipline.

(a) Acts of Indiscipline are dealt with at zero tolerance

(b) Any acts of Indiscipline of a student is first to be considered by the Discipline and

Welfare Committee of the Department/School for necessary action. If the issue demands more serious consideration, the act of indiscipline will be reported to the Dean (Engg.) and he will refer it to the Discipline and Welfare Committee of BIHER, constituted by the Vice Chancellor. The Committee will enquire into the charges and recommend suitable action if the charges are substantiated. The Dean (Engg.) will take appropriate action on the recommendation of the Discipline and Welfare Committee of BIHER.

(c) Anyone found indulging in ragging or any such acts is liable to be dismissed forthwith.

R 7.3 **Suspension:** Dean(Engg.) may suspend a student pending inquiry depending upon the prima facie evidence.

R 7.4 **Appeal:** The aggrieved student may appeal to the Vice Chancellor whose decision will be final and binding.

R.8.0 Attendance

R 8.1 Attendance is the physical presence and active learning participation of a student in the class / laboratory / field work etc., It is a well-observed fact that the students who score good grades are those who attend and participate in all the assigned learning activities in the class / laboratory / field work, regularly. Therefore, the students must strive to attend and sincerely participate in all the assigned learning activities without fail.

R 8.2 Every faculty member facilitating a course will take notice of student attendance and their learning participation till the last instruction day in the semester. The percentage of attendance, calculated up to this point, will be indicated by a code number/letter as follows:

Attendance rounded to	Code
95% and above	H
85 to 94%	9
75 to 84%	8
Below 75%	L

R 8.3 A student must maintain an attendance record of at least 75% in individual courses, *exclusive of leave of absence due to medical reasons, on-duty, extra-curricular / extramural activities, permitted assignments such as job interviews, unforeseen emergencies etc.* Without the minimum attendance of 75%, in any course, students become ineligible to appear for the end semester examination in that course. His / Her registration for that course will be treated as cancelled, and he/she shall be awarded 'I' grade (I stands for Incomplete or registration cancelled for want of minimum attendance) in that course. This grade shall appear in the grade card until the course is successfully completed. A student shall register under "Compensatory Courses (R.3.1)" for the courses in which he/she has attendance less than 75% and complete the same.

R 8.4 A student must strive to attend all the classes without fail. However, the minimum attendance requirement of 75% allows a student the facility to use the balance 25% to account for illnesses, permitted assignments such as job interviews, inter university sports meets, inter-collegiate/inter-university competitions, accidents, unforeseen emergencies etc. An attendance of 75% in a course (except in cases governed by R.8.6) is considered to be the minimum required for a student to get just enough input on the course syllabus through class room contact hours to make him / her eligible to appear in the end semester examination for that course.

It is the responsibility of each and every student to keep track / monitor his / her percentage of attendance for each course and ensure that he / she satisfies the attendance norms prescribed by BIHER. If the student finds any discrepancy / error in the attendance status, he /she should immediately bring it to the attention of the concerned faculty member and seek redressal.

R 8.5 The teacher shall prepare the particulars of all students who have attendance less than 75% in his / her course. Copies of the same should also be sent to the Dean (Engg.), and Heads of Schools/ Departments concerned. ***The students who have less than 75% attendance will not be permitted to appear in end semester examination, and the same will be informed to the student's parents.***

R 8.6 **Condonation of Attendance**: In rare and genuine cases, a committee consisting of Dean and Head of the Department of the concerned department will examine the case, based on the documents submitted by the student, facts and circumstances. Assessment will be done, by the committee, on the merit of the case and spell out their recommendation to the Vice Chancellor. The Vice Chancellor, based on the recommendation of the committee may then give condonation of attendance, only if the Vice Chancellor deems it fit and deserving but in any case, the condonation cannot exceed 10%.

R.9.0 Learning Assessment Procedure

R 9.1 The learning of a student is assessed and evaluated in-house by the course facilitating faculty member/ department except in the case of project work where an external examiner shall be nominated for conducting the viva-voce. All assessments are designed based on Revised Bloom's Taxonomy levels of thinking and learning.
(Anderson, Lorin W, Krathwohl, David R, "A Taxonomy for Learning, Teaching and Assessing: a revision of Bloom's Taxonomy", Longman Publishing, NewYork, 2001)

R 9.2 The student's learning in each course, in general, is assessed (formative) and evaluated (summative) based on *in-semester continuous learning assessment* (internal assessment) and *end-semester final examination*. An *in-semester continuous learning assessment* (also known as internal assessment / comprehensive assessment) is spread through the duration of course and is done by the faculty member facilitating the course. In order to verify the different skills acquired in a student, the continuous learning assessments are (as appropriately) performed through:

(a) Oral Learning Assessments
(b) Written Learning Assessments
(c) Demonstrative Learning Assessments

The end-semester final examination would be conducted two times in an academic year, typically at the end of odd /even semester respectively, and shall have learning assessments from the following perspectives with respect to all courses:

(a) Evaluation with respect to knowledge
(b) Evaluation with respect to Understanding
(c) Evaluation with respect to skill
(d) Evaluation with respect to Applications and/or
(e) Higher Order Thinking Skills

Registration for end-semester final examination for all courses enrolled in that semester is mandatory.

R 9.3 The learning assessment weightage in percentages for every course is provided for each course in the respective course syllabus, and follows the template:

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) (50% weightage)							Final Examination (50% weightage)	
		CLA-1 (10%)		CLA-2 (15%)		CLA-3 (15%)		CLA-4 (10%)		
		Theory	Practice	Theory	Practice	Theory	Practice		Theory	Practice
Level 1	Remember	%	%	%	%	%	%	%	%	%
	Understand									
Level 2	Apply	%	%	%	%	%	%	%	%	%
	Analyze									
Level 3	Evaluate	%	%	%	%	%	%	%	%	%
	Create									
	Total	100 %		100 %		100 %		100 %	100 %	

Note : For a Pure Theory Course, the Practice Part would be zero and similarly for a Pure Practice Course, the theory part would be appropriately zero.

(a) The ratio between Continuous Learning Assessments and Final Examinations for all courses is 50:50.

(b) A student should definitely attend the Final Examination to be eligible to Pass the course.

(c) For a student to PASS in a course, a student has to score a minimum of 50 marks aggregate.

(d) For the Theory Part of a course or a pure theory course; Continuous Assessments CLA-1 (normally in two learning units / modules or as prescribed by the Course Coordinator), CLA-2 (in two learning units / modules not covered in CLA-1 or as prescribed by the Course Coordinator) and CLA-3 (in all the five learning units / modules) are generally conducted as Oral / Written / Demonstrative Assessments of duration 100 minutes, 100 minutes and 180 minutes respectively.

The format for the Oral / Written / Demonstrative Assessments are duly finalized by the respective Course Co- ordinator.

(e) For the Practice Part of a course or a pure Practice course; Continuous Learning Assessments CLA- 1, CLA-2 and CLA-3 are generally conducted at periodic intervals. The format for the Oral / Written / Demonstrative learning assessments and the periodicity for the learning assessments are duly finalized by the Course Co-ordinator for the respective course.

(f) CLA-4 is generally a combination from among one or more of these options:

Assignments	Surprise Tests	Seminars	Multiple Choice Quizzes
Tech. Talks	Field Visits	Self-Study	NPTEL/MOOC/Swayam
Mini-Projects	Case-Study	Group Activities	Online Certifications
Presentations	Debates	Conference Papers	Group Discussions

(g) Student learning from the theory and practice portions in a course shall be assessed separately for 100 marks each and consolidated by assigning a weightage of 50% for theory component and 50% for practical component. Grading shall be done for this consolidated mark.

(h) For the Practice Part (Laboratory/Practical) of a course or a pure Practice (Laboratory/Practical) course; due weightage for carrying out experiments, such as observations, collection of data, analysis, interpretation of results, inferences and also timely submission of record work done would all carry due weightage based on the type of laboratories and the course and constitute the CLA-1, CLA-2, CLA-3. The nature of the end-semester final examination shall be informed to the students at the commencement of the course by the respective course coordinator.

(i) The Final examination (both theory and practice(Laboratory/Practical)) would be conducted only after the last working day of the semester.

(j) The Final examination of a Pure Theory course or a Theory part of a course is generally of 'Written' type, and the duration would be 180 minutes. The format for the question paper would be of three parts; Part-A would be Multiple Choice Questions numbering 20, Part-B would be Short Answer Questions of 5 questions to be answered among 7 questions. Part-C would be Long Answer Questions of 5 questions of either/or type questions.

(k) Final Semester Project Work: The projects undertaken as far as possible should be socially relevant and product oriented. B.Tech. projects can be carried out by individual students or by a group of students with a maximum of five students in a group.

(l) The assessment method for the project work consists of in-semester and end semester evaluations as detailed below:

	Continuous Learning Assessment (50% weightage)			Final Evaluation (50% weightage)	
	Review – 1	Review – 2	Review – 3	Project Report	Viva-Voce
Project Work / Full Internship	5 %	20 %	25 %	20 %	30 %

R 9.4 Whenever there is a deviation from procedures stated under 15.3, as warranted by the unique nature of the course, the same will be specified by the concerned Course Coordinator and approved by the Dean (Engg.).

R.10.0 Re-appearing for Final Examination

(a) Students who have secured 'F'(Fail)/'Ab' (Absent) grade in a particular course can reappear when the end semester final examination for that course is again conducted provided they satisfy other eligibility conditions such as lack of attendance overcome by attending Compensatory courses and minimum credit / appearance in end semester examinations requirements.

(b) For the first two attempts of re-appearing in end-semester final examinations, the internal marks obtained in the first attempt will only be considered and it will be combined with the marks obtained in the end semester examinations for the award of appropriate grade.

(c) However, if a student obtains 'F'(Fail)/'Ab' (Absent) grade in a course in the first two attempts, then from the third attempt onwards, full weightage (100%) shall be assigned to marks scored in the end semester final examinations and the internal assessment marks they have scored during the regular course of study will be ignored.

(d) The first attempt is that which corresponds to the first registration for the course. If a student gets 'F' or 'Ab' in an attempt that is treated as an attempt.

(e) If a student obtains "F" grade or "Ab" grade or "I" grade in a course for which only internal assessment is applicable like (i) Seminars (ii) Industrial training (iii) and other notified courses from time to time he/she should register for compensatory courses for such courses and earn the internal marks as he/she would have earned normally.

(f) Similarly, for project work, if a student gets a 'F' or 'Ab' or 'I' grade he/she should register under compensatory course, earn marks for reviews and project report as applicable and then appear for the final viva. Under the compensatory course the student shall choose a new project topic (other than the one he/she had been associated with earlier) under the guidance of the allotted faculty member.

(g) If a course has both theory and practical component, then the student shall appear in the end-semester final examinations for both the theory and practical components duly.

(h) All applicable fees charged for the purpose of examination will apply for re-appearance courses as well.

R.11.0 Course Wise Grading of Students

R 11.1 Letter Grades and Grade Points (GP) are earned by the student for each course based

on the aggregate of marks obtained through continuous learning assessments and end-semester final examination. The letter grades and the corresponding grade points, as recommended by UGC, are as follows:

Letter Grade	Grade Points	Normalized Mark Range
O (Outstanding)	10	90-100
A+ (Excellent)	9	80-89
A (Very Good)	8	75-79
B+ (Good)	7	70-74
B(Above Average)	6	65-69
C (Average)	5	60-64
P (Pass)	4	50-59
F (Fail)	0	<50 Failure due to insufficient marks in the course
Ab(Absent)	0	Failure due to non-appearance in examination
I (Incomplete)	0	Failure due to insufficient attendance in the course.

For non-credit courses 'PASS' or 'FAIL' shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

R 11.2 A student is considered to have successfully completed a course and earned the credits if he / she secured a letter grade other than 'F' or 'Ab' or 'I' in that course. A letter grade 'F' or 'Ab' or 'I' in any course implies a failure to have completed the course.

R 11.3 A course successfully completed cannot be repeated.

R.12.0 Method of Awarding Letter Grades

R 12.1 The internal marks awarded to the students are first normalized and combined with the normalized marks of end-semester final examination. Subsequently letter grades are awarded for the normalized marks as indicated in the table under section R11.1: The detailed methodology of normalization of internal marks as well as marks in the end-semester final examinations shall be formulated by the Controller of Examinations.

R 12.2 To 'Pass' a course with earnable credits a student has to score a minimum of 50% of the total normalized marks secured in both the continuous learning assessments and the end-semester final examination.

R.13.0 Declaration of Results

R 13.1 Normalized marks are referred to the Result Passing Board for the finalization of results. Controller of Examinations announces the results.

R 13.2 The 'Ab' / 'I' / 'F' grade once awarded stays in the record of the student and is deleted when he/she completes and passes the course successfully later. The grade acquired by the student will be indicated in the grade card of the appropriate academic year with an indication of the month and the year of passing of that course. The CGPA will be accordingly revised.

R.14.0 Re-view of answer scripts

In case any student feels aggrieved on the final outcome of the learning assessment in any course, the student shall apply to the Controller of Examinations, along with the prescribed fee, for the review of only the end-semester final examination answer scripts, within the stipulated time after the announcement of the results of the examinations. The Controller of Examinations shall facilitate the review of the answer script jointly to be carried out by the student and the faculty detailed for this purpose. If any discrepancy is noticed during review the same shall be rectified and the originally awarded grade would be accordingly amended.

R.15.0 Grade Card

R 15.1 The grade card issued by the Controller of Examinations to each student, after the announcement of the results will contain the following:

(a) The credits for each course registered for that semester

(b) The letter grade obtained in each course

(c) The attendance code in each course

(d) The total number of credits earned by the student up to the end of that semester

(e) The Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) of all the courses taken from the I semester onwards for regular students and from III semester onwards for lateral entry students. For lateral entry students, the grades awarded in the bridge courses shall also be taken into consideration.

R 15.2 Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

(a) **SGPA** will be calculated according to the formula: $SGPA = \frac{\sum_{i=1}^{n} C_i \times GP_i}{\sum_{i=1}^{n} C_i}$

Where C_i = credit for the i^{th} course, GP_i = the grade point obtained for the i^{th} course, n = total number of courses and the sum is over all the courses taken in that semester, including those in which the student has secured F grades.

(b) **CGPA** (Cumulative Grade Point Average) is calculated using: $CGPA = \frac{\sum_{i=1}^{r} S_i \times SGPA_i}{\sum_{i=1}^{r} S_i}$ where S_i = Sum of credits in i^{th} semester, $SGPA_i$ = Semester Grade Point Average earned in i^{th} semester and r = number of semesters and the sum is over all the semesters under consideration.

(c) The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

R 15.3 Class/Distinction will be awarded to the students after they successfully complete the B.Tech. programme as per the norms stipulated in the following table:

Regular Student:

Category	CGPA (From I - VIII semesters)	Class / Distinction
Students who successfully complete the B.Tech. programme within the time duration of 8 semesters (R.10.0)	≥ 4.0 & < 5.5	Pass
	≥ 5.5 & < 6.0	Second Class
	≥ 6.0 & < 8.0	First Class
	≥ 8.0 (without 'Ab' or 'F' or 'I' or 'temporary withdrawal' in any Semester)	First Class with Distinction
	≥ 8.0 (with 'Ab' or 'F' or 'I' in any Semester but obtained pass grade ('O' to 'P') subsequently)	First Class
Students who cannot complete the B.Tech. program in 8 semesters but complete it successfully within the time duration of 9 semesters (R.4.1)	≥ 4.0 & < 5.5	Pass
	≥ 5.5 & < 6.0	Second Class
	≥ 6.0	First Class
Students who cannot complete the B.Tech. program in 9 semesters but complete it successfully within the time duration of 12 semesters (R.4.1)	≥ 4.0 & < 5.5	Pass
	≥ 5.5	Second Class

Lateral Entry Student:

Category	CGPA (From III - VIII semesters including bridge courses)	Class / Distinction
Students who successfully complete the B.Tech. programme within the time duration of 6 semesters (R.4.1)	≥ 4.0 & < 5.5	Pass
	≥ 5.5 & < 6.0	Second Class
	≥ 6.0 & < 8.0	First Class
	≥ 8.0 (without 'Ab' or 'F' or 'I' or 'temporary withdrawal' in any Semester)	First Class with Distinction
	≥ 8.0 (with 'Ab' or 'F' or 'I' in any Semester but obtained pass grade ('O' to 'P') subsequently)	First Class
Students who cannot complete the B.Tech. program in 8 semesters but complete it successfully within the time duration of 7 semesters (R.4.1)	≥ 4.0 & < 5.5	Pass
	≥ 5.5 & < 6.0	Second Class
	≥ 6.0	First Class
Students who cannot complete	≥ 4.0 & < 5.5	Pass

the B.Tech. program in 9 semesters but complete it successfully within the time duration of 10 semesters (R.4.1)	≥ 5.5	Second Class

R.16.0 Academic Dishonesty

When a student is found responsible for a violation of the BIHER code of conduct pertaining to academic dishonesty (Malpractice in Examinations), the Office of Controller of Examinations will initiate action based on the pre-approved procedures. Appropriate penalty or punishment will be awarded to the student and communication sent to the concerned Head of the Institution. The matter will be informed to the students' parents duly.

R.17.0 Eligibility for Award of the B.Tech. Degree

A student shall be declared to be eligible for the award of the B.Tech degree, if he/she has

(a) Registered and successfully completed the courses and projects as per the curriculum and obtaining an aggregate of learning credit totalling 160.

(b) Successfully acquired the required learning credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time duration.

(c) No disciplinary action is pending against him/her.

R.18.0 Eligibility for Award of the Minor Certificate : A student to become eligible for the Award of the Minor Certificate in the chosen area of specialization, he/she has to acquire an additional of 20 credits in the chosen Minor subject area, over and above the credits required for the award of the B. Tech Degree

R.19.0 Change of Regulations

R 19.1 Any regulation can be modified by the Academic Council of BIHER.

Bharath
INSTITUTE OF HIGHER EDUCATION AND RESEARCH
(Declared as Deemed-to-be University under section 3 of UGC Act, 1956)
(Vide Notification No. F.9-5/2000 - U.3, Ministry of Human Resource Development, Govt. of India, dated 4th July 2002)

B.Tech Information Technology

(Four Years)

(Choice Based Credit System)

Student's Handbook

DEPARTMENT OF INFORMATION TECHNOLOGY

SCHOOL OF COMPUTING

BHARATH INSTITUTE OF SCIENCE AND TECHNOLOGY

CHENNAI-600 073, TAMIL NADU

Part – A

1. **Title of the Academic Program**

   B.Tech Information Technology

2. **Vision of the Institute**

   Bharath Institute of Higher Education & Research (BIHER) envisions and constantly strives to provide an excellent academic and research ambience for students and members of the faculties to acquire professional competence along with human dignity, and spearhead the transformation of community through continuous discovery in science and technology.

3. **The Mission of the University**

UM1	To develop as a Premier University for Teaching, Learning, Research and Innovation on par with leading global universities.
UM2	To impart education and training to students for creating a better society with ethics and morals.
UM3	To foster an interdisciplinary approach in education, research and innovation by supporting lifelong professional development, enriching knowledge banks through scientific research, promoting best practices and innovation, industry-driven and institute-oriented cooperation, globalization and international initiatives.
UM4	To develop as a multi-dimensional institution contributing immensely to the cause of societal advancement through spread of literacy, an ambience that provides the best of international exposures, provide health care, enrich rural development and most importantly impart value-based education.
UM5	To establish benchmark standards in professional practice in the fields of innovative and emerging areas in medicine, dentistry, nursing, physiotherapy, allied sciences, engineering, and management.
UM6	To launch new programmes with innovative curriculum design by provide multi-faceted exposure in various subjects.
UM7	To provide flexibility to students - options / add-ons to core subjects, develop Device Agnostic Technology to access online content.
UM8	Funding / incubation entrepreneurial ideas, Flipped class room – Integrated Courses & Need based learning.

4. **Name of the School offering the Program**

   School of Computing

5. **Name of the Department offering the Program**

   Department of Information Technology

6. **The Vision of the Department**

   To produce competent IT professionals who are technically sound and ethically strong for the industries, community and research organizations at the national and global levels through excellence in teaching, research and consultancy.

7. **The Mission of the School/Department**

M1	Develop the students, strong in engineering fundamentals, proficient in technical skills, strong in ethical values and knowledge able in applying the skills for the welfare of the society through competent faculty.
M2	Provide state of the art facilities in which higher studies and research flourish amongst the students.
M3	Enhance the collaborative partnership between Industry, R&D organization to promote research among faculty, students and also preparing the student to be an entrepreneur.
M4	Bring out the aggregate identity and accentuating moral esteems of students.

8. Description of the Programme

B. Tech. in Information Technology aims at providing a strong foundation for the students aspiring a career in the field of the software industry and IT-enabled service industry. This programme produces graduates with broad understanding of Information Technology through robust curriculum and hands-on learning in niche technologies to develop competence which caters to the requirements of the industry. It primarily deals using, maintaining and improving computer systems with strong focus on courses related to technologies to solve business processes.

They would be employable in companies related to software development, embedded system design, IOT based application industry, Sensor technology, machine learning, artificial intelligence, big data analysis, networking, and many more. In addition, they can pursue their higher education/research in the above areas at national or international universities.

9. **Programme Educational Objects (PEO)**

PEO 1	Exhibit comprehensive knowledge in IT solution development leading to excellence in professional career and/or higher education including research.
PEO 2	Provide solutions making use of the knowledge gained in Artificial Intelligence, Cloud Computing, Data Science, E-commerce Platform, Cyber Security and Communication.
PEO 3	Adapt to continuously changing technologies to develop innovative applications with ethical and social commitment.

10. Programme Outcomes

PO 1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	**Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis

	and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.
PO 5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

11. Programme Specific Outcome

PSO 1	**Programming Design :** Design and develop algorithm for real life problems using latest technologies and solve it by using computer programming languages and database technologies .
PSO 2	**IT Business Scalable Design :** Analyze and recommend computing infrastructures and operations requirements and Simulate and implement information networks using configurations, algorithms, suitable protocol and security for valid and optimal connectivity.
PSO 3	**Intelligent Agents Design :** Design and execute projects for the development of data modeling, data analytics and knowledge representation in various domain.

12. Mapping / Alignment of University's Mission Vs School/Department's Mission

	U1	U2	U3	U4
UM1	✓			
UM2		✓		
UM3	✓	✓		
UM4			✓	✓
UM5				

UM6		✓		
UM7			✓	
UM8	✓			

13. Mapping / Alignment of School/Department's Mission Vs PEOs

	PEO 1	PEO 2	PEO 3
M1	✓	✓	
M2		✓	✓
M3	✓		✓
M4			✓

14. Mapping / Alignment of PEO Vs PO & PSO

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
PEO 1	✓	✓		✓		✓			✓	✓			✓		
PEO 2		✓		✓	✓		✓			✓				✓	
PEO 3		✓	✓	✓			✓		✓		✓	✓			✓

Part – B – Curriculum Framework

15. Duration of Program: Year/Semesters

4 Years / 8 Semesters

16. Total Minimum credit requirement and weightage of Course categories

COURSE CATEGORY	Category Code	Minimum Credit Required
Basic Sciences (B)	B	32
Humanities and Social Sciences (H)	H	12
Engineering Sciences (E)	E	19
Professional Core (C)	C	52
Professional Elective (S)	S	18
Open Elective (O)	O	12
Project and Internship (P)	P	15
Total		**160**

Category Code	Course Code	Course Title	L	T	P	C	Pre-Requisite
B	U20PYBJ03	Semiconductor Physics	3	1	2	5	HSC

B	U20CYBJ01	Engineering Chemistry	3	1	2	5	HSC
B	U20PYBB01	Foundation of Physics	2	0	0	2	Diploma
B	U20CYBB01	Foundation of Chemistry	2	0	0	2	Diploma
B	U20MABB01	Foundation of Mathematics	2	0	0	2	Diploma
B	U20MABT01	Calculus and linear Algebra	3	1	0	4	HSC
B	U20MABT02	Advanced Calculus and Complex Analysis	3	1	0	4	HSC
B	U20MABT03	Transforms and boundary Value Problems	3	1	0	4	U20MABT01, & U20MABT02, Or Diploma
B	U20MABT07	Probability and Queuing Theory	3	1	0	4	U20MABT03
B	U20MABT08	Discrete Mathematics for Engineers	3	1	0	4	U20MABT07
B	U20BTBT01	Biology for Engineers	2	0	0	2	HSC or Diploma
H	U20LEHJ01	Technical English	2	0	2	3	HSC
H	U20MBHT01	Management principles for Engineers	3	0	0	3	HSC or Diploma
H	U20PDHJ01	Employability skills and Practices	2	0	2	3	HSC or Diploma
H	U20CYHT01	Social and Environmental Engineering	3	0	0	3	HSC or Diploma
E	U20MEEJ01	Engineering Graphics and Design	1	0	6	4	HSC
E	U20EEEJ01	Basic Electrical and Electronics Engineering	3	0	2	4	HSC
E	U20MEEJ02	Basic Civil and Mechanical Engineering	3	0	2	4	HSC
E	U20MEET01	Engineering Mechanics	3	0	0	3	HSC or Diploma
E	U20CSEJ01	Programming for problem Solving	3	0	2	4	HSC
C	U20ITCJ01	Programming for Data structures and Algorithms	3	0	2	4	U20CSEJ01 or Diploma
C	U20ITCJ05	Database Technology	3	0	2	4	U20CSEJ01 or Diploma
C	U20ITCT01	Object Oriented Software Engineering	3	0	0	3	U20MABT01 or Diploma
C	U20ITCT03	Enterprise Resource Planning and Implementation	3	0	0	3	U20PDHJ01 or Diploma
C	U20ITCT02	Graph Theory Applications for Computer Networks	3	0	0	3	U20CSEJ01 or Diploma
C	U20ITCJ02	Web Designing and Development	3	0	2	4	U20ITCJ01
C	U20ITCJ03	Network & Communication	3	0	2	4	U20ITCT03
C	U20ITCJ07	Operating System	3	0	2	4	U20ITCT01

C	U20ITCT06	Artificial Intelligence	3	0	0	3	U20ITCT01
C	U20ITCT08	IOT Programming	3	0	0	3	U20ITCT03
C	U20ITCJ04	Data Mining	3	0	2	4	U20ITCJ06
C	U20ITCT04	Human Computer Interaction	3	0	0	3	U20ITCJ07
C	U20ITCT05	Quantum Information Processing	3	0	0	3	U20ITCJ04
C	U20ITCT07	Information Coding	3	0	0	3	U20ITCT04
C	U20ITCJ06	Digital Image Processing	3	0	2	4	U20ITCT05
P	U20ITPI01	Comprehension	0	0	2	2	PC>=32
P	U20ITPI02	Summer Internship	0	0	2	1	U20ITPI01
C	U20ITPR01	Mini Project	3	0	0	3	U20ITPI02
C	U20ITPR02	Project Work	0	0	18	9	U20ITPR01
S	U20ITST01	Full Stack Development	2	1	0	3	U20ITCJ03
S	U20ITST02	Big data Analytics and Visualization	2	1	0	3	U20ITST01
S	U20ITST03	Ethical Hacking and Digital Forensics	2	1	0	3	U20ITST01
S	U20ITST04	Cloud Computing and Virtualization	2	1	0	3	U20ITST01
S	U20ITST05	Machine Learning	2	1	0	3	U20ITST01
S	U20ITST06	Block Chain Technologies	2	1	0	3	U20ITST02
S	U20ITST07	Scripting Languages	2	1	0	3	U20ITST04
S	U20ITST08	Virtual Reality	3	0	0	3	U20ITST05

U20ITCJ05- DATABASE TECHNOLOGY

Introduction of the Course

Databases form the backbone of all major applications today – tightly or loosely coupled, intranet or internet based, financial, social, administrative, and so on. Structured Database Management Systems (DBMS) based on relational and other models have long formed the basis for such databases. Consequently, Oracle, Microsoft SQL Server, Sybase etc. have emerged as leading commercial systems while MySQL, PostgreSQL etc. lead in open source and free domain.

Course Code	Course Category	Course Title	L 3	T 0	P 2	C 4
U20ITCJ05	C	DATABASE TECHNOLOGY	Pre- requisite: U20CSEJ01 or Diploma			
Name Of the Course Coordinator:		Ms.D.Sharmila	Contact Hrs: 75			
Course Offering Department/School:		Department of IT	Total Marks :100			

Course Objective and Summary

- To understand the concept of DBMS and ER Modeling.
- To explain the normalization, Query optimization and relational algebra.
- To apply the concurrency control, recovery, security and indexing for the real time data.

Course Outcomes (COs)

Course Outcomes (COs)		BT Level
CO1	Explain the basic concept and role of DBMS in an organization.	2
CO2	Illustrate the design principles for database design, ER model and normalization.	2
CO3	Demonstrate the basics of query evaluation and heuristic query optimization techniques.	2
CO4	Apply Concurrency control and recovery mechanisms for the desirable database problem.	3
CO5	Compare the basic database storage structure and access techniques	4
CO6	Implement the database system with the fundamental concepts of DBMS.	B

Mapping / Alignment of COs with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2	3	2											3		

CO3	3	2		2									3		
CO4		2	3										3		
CO5		3	2	2									3		
CO6		2	3		2								3		
(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)															

Content of the Course

UNIT I DATA MODELS **(9)**

History and motivation for database systems - characteristics of database approach - Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements - Workers behind the scene Advantages of using DBMS approach - Database Querying – Simple queries, Nested queries, Sub queries and Joins - Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Views, Sequences, Synonyms.

UNIT II RELATIONAL DATABASE DESIGN AND QUERY LANGUAGES
(9)

The Database System Environment - Centralized and Client/Server Architectures for DBMSs - Centralized and Client/Server Architectures for DBMSs - Database Programming: Implicit and Explicit Cursors - Classification of database management systems - Entity Relationship Model: Types of Attributes, Relationship, Structural Constraints - Relational Model, Relational model Constraints - Mapping ER model to a relational schema - Database Triggers.

UNIT III QUERY PROCESSING AND OPTIMIZATION
(9)

Integrity constraints - Guidelines for Relational Schema - Exception Handling - Functional dependency; Normalization - Boyce Code Normal Form - Multi-valued dependency and Fourth Normal form - Join dependency and Fifth Normal form - Database Connectivity with Front End Tools.

UNIT IV TRANSACTION PROCESSING
(9)

Translating SQL Queries into Relational Algebra - heuristic query optimization - Introduction to Transaction Processing - Transaction and System concepts - Desirable properties of Transactions - Characterizing schedules based on recoverability and serializability - Two-Phase Locking Techniques for Concurrency Control - Concurrency Control based on timestamp.

UNIT V DATABASE SECURITY **(9)**

Recovery Concepts - Recovery based on deferred update - Recovery techniques based on immediate update - Shadow Paging - Indexing: Single level indexing - multi-level indexing - dynamic multilevel Indexing - Need of NoSQL.

Contact Hours (45)

List of Experiments (Contact Hours 30)

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins.
3. Views, Sequences, Synonyms.

4. Database Programming: Implicit and Explicit Cursors.
5. Procedures and Functions.
6. Database Triggers.
7. Exception Handling.
8. Database Design using ER modeling, normalization and Implementation for any application.
9. Database Connectivity with Front End Tools.
10. Case Study using real life database applications.

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	
6	Model Lab exam	50	50	L00
7	Final Lab exam	50	50	

Text Books

1. Raghu Ramakrishnan, Database Management Systems, Mc Graw - Hill, 4thedition, 2015.

Reference Books

2. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation and Management, 6thEdition, 2012.
3. R.Elmasri S.B.Navathe,FundamentalsofDatabaseSystems,AddisonWesley,2015

Other Resources (Online Resources or others)

- https://iran-lms.com/images/images/Books/PDF/Fundamentals-of-Database-Systems-Pearson-2015-Ramez-Elmasri-Shamkant-B.-Navathe.pdf

U20ITCJ01 – Data Structures and Algorithms

INTRODUCTION OF THE COURSE

Data Structure is the group of data elements which provides an efficient way of storing and organizing data in the computer so that it can be used efficiently.

Course Code	Course Category	Course Title	L 2	T 0	P 2	C 3
U20ITCJ01	C	Data Structures and Algorithms	Pre- requisite: U20CSEJ01			
Name Of the Course Coordinator:		Dr.Yogesh	Contact Hrs : 60			
Course Offering Department/School:		Department of CSE	Total Marks :100			

Course Objective and Summary

The Objective of the course is to introduce the concepts to write algorithms and solve problem using the fundamental of data structures in a step-by-step approach.

Course Outcomes (Cos)

CO No.	Course outcome	Blooms level
CO1	Demonstrate the basics of data structures and various algorithms	2
CO2	Experiment with Various Linear ADTs - Lists, stacks, queues and its applications.	3
CO3	Construct the trees with its representations and methods.	3
CO4	Compare various sorting algorithms, properties, and its methods	4
CO5	Interpret hashing concepts and its techniques	5
CO6	Justify the non-linear data structures graph with its various methods.	5

Mapping / Alignment of Cos with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**1**	**3**	**-**	**3**	**1**	**-**	**-**	**-**	**1**	**1**	**-**	**3**	**3**	**2**	2
CO2	**2**	**3**	**1**	**2**	**1**	**-**	**-**	**-**	**2**	**1**	**-**	**3**	**3**	**2**	2
CO3	**2**	**3**	**2**	**3**	**1**	**-**	**-**	**-**	**2**	**1**	**-**	**3**	**3**	**2**	2
CO4	**2**	**3**	**2**	**3**	**1**	**-**	**-**	**-**	**2**	**1**	**-**	**3**	**3**	**2**	2
CO5	**1**	**3**	**--**	**3**	**1**	**-**	**-**		**1**	**1**	**-**	**3**	**3**	**2**	2
CO6	**3**	**3**	**2**	**3**	**1**	**-**	**-**	**-**	**2**	**1**	**-**	**3**	**3**	**2**	2

(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)

CONTENT OF THE COURSE

Unit I Introduction **6 hours**

Concepts of Data objects and structures, ADT, Algorithms - Complexity, Time, Space, Mathematical notations, Asymptotic notations, Performance analysis of Algorithms, Classification of data structures.

Unit II List, Stack and Queue **6 hours**

List ADT- Representation of List ADT, Singly Linked List - Doubly Linked List - Circular Linked List, Stack - Implementation of a Stack, Applications of Stack, Queues- Implementation of Queue, Applications of Queue.

Unit III Trees **6 hours**

General trees, Representation of trees, Tree traversal- Binary tree, Representation, Expression tree, Binary tree traversal, **Binary Search Tree:** Searching, Insertion, Deletion, **AVL trees:** Rotation, Insertion, Deletion, B-Trees, Splay trees.

Unit IV Sorting and Hashing **6 hours**

Sorting algorithms and its Properties. Types of Sorting: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort Algorithms. Performance and Comparison among all the Sorting methods, Hashing Technique – Hash Collision – Hash Collision Techniques.

Unit V Graph **6 hours**

Graphs and Networks: Implementation of Graphs - Types of Graphs: Adjacency Matrix- Depth First Search - Breath First Search. Networks: Minimum Spanning Tree - The Shortest path Algorithm.

List of Experiments **(30 hrs)**

1. Simple Structures & Class Implementation
2. Complexity of Fibonacci series
3. Complexity for the Factorial of a number
4. Implementation of Singly Linked List
5. Implementation of Doubly Linked List
6. Implementation of Stack (using Array & Linked List)
7. Implementation of Queues (Using Array & Linked List)
8. Implementation of Trees (Searching, Insertion & Deletion)
9. Implementation of Trees
10. Implementation of Sorting algorithms (Insertion sort, Selection sort)
11. Implementation of Merge Sorting algorithms
12. Implementation of Hash Table
13. Implementation of DFS
14. Implementation of BFS
15. Implementation of Path finding Algorithm (Single Source Shortest Path)

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	100
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	
6	Model Lab exam	50	50	100
7	Final Lab exam	50	50	

TEXT BOOKS:

1. Jean Paul Tremblay, Paul. G. Sorenson, "An Introduction to Data Structures with applications"
2. Sartaj Sahni, "Data Structures, Algorithms and Applications in C++", Second Edition, Universities Press.
3. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, and Computer Science Press.

REFERENCE BOOKS:

1. Horowitz, Sahni, Mehta, "Fundamentals of Data Structures in C++", 2nd Edition, Universities Press.
2. A.V.Aho, Hopcroft, Ullman, "Data Structures & Algorithms", Pearson Education.
3. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.
4. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

NPTEL WEB COURSE:

- https://nptel.ac.in/courses/106/102/106102064/

U20ITCT01 - OBJECT ORIENTED SOFTWARE ENGINEERING

This course introduces students to the different software development lifecycle (SDLC) phases used in developing, delivering, and maintaining software products. Students will also acquire basic software development skills and understand common terminology used in the software engineering profession. Students will also learn and practice using traditional coding standards/guidelines.

Introduction of the Course

Course Code	Course Category	Course Title	L	T	P	C
			3	0	0	3
U20ITCT01	C	OBJECT ORIENTED SOFTWARE ENGINEERING	**Pre-requisite** U20CSEJ01and Diploma			
Name of the Course Coordinator		Dr.A.Kumaravel	**Contact Hours:** 45			
Course Offering Dept / School		Dept. IT/ School of Computing	**Total Marks :** 100			

Course Objective and Summary

To make the students understand the essential and fundamental aspects of object oriented concepts along with their applications. To discuss and explore different analysis models, design and implement models of object-oriented software systems by means of a mid-sized project. To teach the students a solid foundation on different software development life cycle of Object Oriented solutions for Real-World Problems.

COURSE OUTCOMES (COs)

	Course Outcomes (COs)	BTL
CO1	Identify and select suitable Process Model for the given problem and have a thorough understanding of various Software Life Cycle models.	3
CO2	Explain the requirements of the given software project and produce requirement specifications.	3
CO3	Discover the knowledge of object-oriented modeling concepts and design methods with a clear emphasis on Unified Modeling Language for a moderately realistic object-oriented system.	3
CO4	Manipulate various software architectures, including frameworks and design patterns, when developing software projects.	4
CO5	Summarize the software project using various Testing techniques.	5

MAPPING / ALIGNMENT OF COs WITH POs & PSOs

	P	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO

	O1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	1		3	2	2								2		
CO2	1		3	2	2								2		
CO3	1		3	1	2								2		
CO4	1		3	2	2								2		
CO5	1		3	2	2								3		
CO6	1		3	2	2								3		

Course Contents

UNIT I INTRODUCTION TO SOFTWARE DEVELOPMENT s 9

The Challenges of Software Development – An Engineering Perspective – Object-Orientation – Iterative Development Processes - Process Models - Life cycle models – Unified Process – Iterative and Incremental – Workflow – Agile Processes.

UNIT II MODELLING AND ANALYSIS 9

Requirements Elicitation – Use Cases – Unified Modelling Language, Tools – Analysis - Object Model (Domain Model) – Analysis Dynamic Models – Non-functional requirements – Analysis Patterns.

UNIT III DESIGN 9

System Design, Architecture – Design Principles - Design Patterns – Dynamic Object Modelling – Static Object Modelling – Interface Specification – Object Constraint Language.

UNIT IV DESIGN PATTERNS 9

Introduction – Design Pattens in Smalltalk MVC – Describing Design patterns –Catalog of Design Patterns- Organizing the Catalog –How Design Patterns Solve Design Problems – How to select a Design Pattern – How to use a Design Pattern – What makes a pattern? – Pattern Categories – Relationship between Patterns – Patterns and Software Architecture.

UNIT V IMPLEMENTATION, DEPLOYMENT AND MAINTENANCE 9

Mapping Design (Models) to Code – Testing - Usability – Deployment – Configuration Management – Maintenance Recent Trends in Object oriented Software Development.

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	100
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	

TEXT BOOKS

1. Carol Britton and Jill Doake, A Student Guide to Object-Oriented Development (Oxford: Elsevier, 2005).
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable object-oriented software”, Addison-Wesley, 1995.

3. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd Edition, Pearson Education, 2004.

REFERENCE BOOKS

1. Software Engineering: A practitioner's approach by Roger S. Pressman, 7th edition, McGraw-Hill International edition
2. Software Engineering by Ian Sommerville, 7th edition, Addison-Wesley.
3. Fundamentals of Software Engineering by Rajib Mall

U20ITCT02– GRAPH THEORY APPLICATIONS FOR COMPUTER NETWORKS

This course provides an introduction to computer networks, with a special focus on the Internet architecture and protocols. Topics include layered network architectures, addressing, naming, forwarding, routing, communication reliability, the client-server model, web and email protocols.

Course Code	Course Category	Course Title	L 3	T 0	P 0	C 3
U20ITCT02	C	**GRAPH THEORY APPLICATIONS FOR COMPUTER NETWORKS**	Pre- requisite: U20CSEJ01 or Diploma			
Name Of the Course Coordinator:		Dr. Yogesh Rajkumar	Contact Hrs: 45			
Course Offering Department/School:		Department of IT	Total Marks :100			

Course Objective and Summary

Be familiar with the most fundamental Graph Theory topics and results.
Be exposed to the techniques of proofs and analysis.

Course Outcomes (COs)		BT Level
CO1	Write precise and accurate mathematical definitions of objects in graph theory.	2
CO2	Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples.	3
CO3	Validate and critically assess a mathematical proof.	3
CO4	Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.	3
CO5	Reason from definitions to construct mathematical proofs.	3

Mapping / Alignment of COs with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
CO1	3	3	2										2			
CO2	3	3	3										2			
CO3	3	3	2										2			

CO4	3	3	3										3			
CO5		3	3										3			
(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)																

Content of the Course

UNIT: 1INTRODUCTION TO GRAPHS **9**

Graphs – Introduction – Sub graphs – Walks, Paths, Circuits – Network applications - Network hardware - Network software - Reference models: OSI, TCP/IP – Internet - Connection oriented Network. THE PHYSICAL LAYER: Performance - Guided transmission media – Unguided transmission media - The public switched telephone networks.

UNIT: 2 THE DATA LINK LAYER **9 HOURS**

Introduction - Link-Layer Addressing - Design issues - Error detection and Error correction - Elementary data link protocols - Example data link protocols - Sliding window protocols – HDLC..THE MEDIUM ACCESS SUBLAYER: Channel allocation problem - Multiple access protocols – Ethernet - Wireless LAN – Bluetooth – Connecting Devices.

UNIT: 3 NETWORK LAYER **9 HOURS**

Network Layer Services – Packet Switching – Performance – IPV4 Addresses – Forwarding of IP Packets – Network Layer Protocols: IP, - ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting - Basics – IPV6 Addressing – IPV6 Protocol

UNIT: 4 TRANSPORT LAYER **9**

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.

UNIT: 5 APPLICATION LAYER **9**

WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	
6	Model Lab exam	50	50	L00
7	Final Lab exam	50	50	

Text Books

1. Narsingh Deo, “Graph Theory: With Application to Engineering and Computer Science”, Prentice Hall of India, 2003.

Reference Books

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable object-oriented software”, Addison-Wesley, 1995.

2. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd Edition, Pearson Education, 2004.

Other Resources (Online Resources or others)

https://www.geeksforgeeks.org/graphtheory-engineering-software-theory-managemenspm.

U20ITCJ02 – WEB DESIGNING AND DEVELOPMENT

Introduction of the Course

Web design is the planning and creation of websites. This includes a number of separate skills that all fall under the umbrella of web design. Some examples of these skills are information architecture, user interface, site structure, navigation, layout, colors, fonts, and overall imagery. All of these skills are combined with the principles of design to create a website that meets the goals of the company or individual from whom that site is being created.

Course Code	Course Category	Course Title	L 3	T 0	P 2	C 4
U20ITCJ02	C	WEB DESIGNING AND DEVELOPMENT	Pre- requisite: U20ITCT06 or Diploma			
Name Of the Course Coordinator:		Ms. D. Sharmila	Contact Hrs: 75 (45+30)			
Course Offering Department/School:		Department of IT	Total Marks :100			

Course Objective and Summary

- This course is concerned with the development of applications on mobile and wireless Computing platforms.
- Android and IOS will be used as a basis for teaching programming techniques and design patterns related to the development of standalone applications and mobile portals to enterprise.
- Emphasis is placed on the processes, tools and frameworks required to develop applications for current and emerging mobile computing devices.

Course Outcomes (COs)		BT Level
CO1	Design simple web pages using markup languages like HTML and XHTML.	2
CO2	Gain knowledge of client-side scripting, validation of forms and AJAX programming.	2
CO3	Understand server-side scripting with PHP language.	2
CO4	Understand what XML is and how to parse and use XML Data with Java.	3
CO5	To introduce Server-side programming with Java Servlets and JSP.	4
CO6	Represent web data using XML and develop web pages using JSP.	B

Mapping / Alignment of COs with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3		
CO2	3	2											3		
CO3	3	2		2									3		
CO4		2	3										3		
CO5		3	2	2									3		
CO6		2	3		2								3		
(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)															

Content of the Course

UNIT I HTML, CSS **9**

Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, HTML5. CSS: Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution.

UNIT II JAVASCRIPT **9**

The Basic of JavaScript: Objects, Primitives Operations and Expressions, ScreenOutput and Keyboard Input, Control Statements, Object Creation and Modification, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions DHTML: Positioning Moving and Changing Elements.

UNIT III XML **9**

XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches, AJAX. A New Approach: Introduction to AJAX, Integrating PHP and AJAX.

UNIT IV PHP PROGRAMMING **9**

Introducing PHP: Creating a PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions. Working with forms and Databases such as MySQL.

UNIT V JSP APPLICATION DEVELOPMENT **9**

The Anatomy of a JSP Page, JSP Processing. JSP Application Design and JSP Environment, JSP Declarations, Directives, Expressions, Scripting Elements, implicit objects. Java Beans: Introduction to Beans, Deploying java Beans in a JSP page.

(45 Hrs)

List of Experiments (30 Hrs)

1. Create a HTML page, which has properly aligned paragraphs with image along with it.
2. Write a program to display list of items in different styles.
3. Create both client side and server side image maps.
4. Create your own style sheets and use them in your web page.
5. Create a form with various fields and appropriate front and validations using any one of the scripting languages.
6. Write a program to store the form fields in a database, use any appropriate Server Slide Scripting.
7. Create a web page using XML.
8. Write a program to connect a XML web page to any database engine.
9. Implement and modify the PHP program to use an xml instead of database.

10. Write a program to design a simple calculator using (a) JavaScript (b) PHP (c) Servlet and (d) JSP.

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	
6	Model Lab exam	50	50	L00
7	Final Lab exam	50	50	

Text Books

4. Computer Networks,A.S.Tanenbaum, Fifth Edition ,Pearson Education,2023.

Reference Books

5. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd edition. (2021)
6. iOS Programming, The Big Nerd Ranch Guide, Christian Keur, Aaron Hillegass,2020.

Other Resources (Online Resources or others)

- https://www.youtube.com/watch?v=9BIN99Rhocq
- https://www.youtube.com/watch?v=ieWtCaWkzYQ

U20ITCJ07 OPERATINGSYSTEMS

PartA-Introduction of the Course

Course Code	U20ITCJ07	L	T	P	C
		2	0	2	3
Course Title	OPERATINGSYSTEMS				
Course Category	Professional Core (C)	Contact Hrs	45		
Pre-requisite	U20CSCT01	Co- Requisite			
Name of the Course Co-ordinator	Ms. C. ANURADHA				
Course offering Dept/School	CSE				

Course Objective and Summary

To understand how an operating system controls the computing resources and provide services to the users
To understand the operating system functions, design and implementation

Course Outcomes (COs)

CO1	Illustrate the basic concepts, functionalities and structure of Operating System

CO2	Describe the concepts of process, threads, process scheduling and to clarify interprocess communication, memory management, file and disk management methods.
CO3	Solve the process synchronization, mutual exclusion, deadlock and memory management problems
CO4	Implement the algorithms for process and disk scheduling and memory management.
CO5	Analyze algorithms of process and disk scheduling and memory management.
CO6	Evaluate process synchronization, process scheduling, memory management and disk scheduling algorithms.

Mapping / Alignment of COs with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3			3								3		
CO2	3	3			2								3	3	
CO3	3	3			2								3		
CO4	3	3			2								3		
CO5		3			2								3		
CO6				3	2								3		

(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	
6	Model Lab exam	50	50	L00
7	Final Lab exam	50	50	

Text Books

1. Abraham Silbers chatz, Peter B. Galvin, Greg Gagne Operating System Concepts, Wiley (2018).
2. Ramez Elmasri, A. Gil Carrick, David Levine, Operating Systems, A Spiral Approach-McGraw Hill Higher Education (2010).

Reference Books

1. Remzi H. Arpaci- Dusseau, AndreaC. Arpaci-Dusseau, Operating Systems, Three Easy Pieces, Arpaci- Dusseau Books, Inc (2015).
2. Andrew S. Tanenbaum, Modern Operating Systems, Pearson, 4th Edition (2016).
3. William Stallings, Operating Systems: Internals and Design Principles, Pearson, 9th

Edition (2018).

11. Any other Resources / Online :

https://www.udacity.com/course/introduction-to-operating-systems--ud923

U20ITCJ03 - NETWORK AND COMMUNICATION

Part A- Introduction of the Course

Course Code	U20ITCJ03	L	T	P	C
		3	0	2	4
Course Title	DATA MINING				
Course Category	Professional Core (C)	Contact Hrs	75		
Pre-requisite		Co- Requisite	Nil		
Name of the Course Coordinator					
Course offering Dept./School	IT / SoC				

Course Objective and Summary

- To Focus on information sharing and networks.
- To Introduce flow of data, categories of network, different topologies.
- To Focus on different coding schemes.
- Brief the students regarding protocols and standards.
- To give clear idea of signals, transmission media, errors in data communications and their correction, networks classes and devices,etc.

Course Outcomes (COs)

CO1	Summarize the models in computer networks
CO2	
CO3	
CO4	

Mapping / Alignment of COs with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2										3	3	
CO2	3	3	3										3	3	
CO3	3	3	2	3									3	3	
CO4	3	3	3	3									3	3	
CO5		3	3										3	3	
CO6		1	2	3									2	2	

(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)

UNIT – I : INTRODUCTION TO DATA COMMUNICATION.

Data Communications – Networks - Network Types - Internet History - Standards and Administration. Networks Models: Protocol Layering - TCP/IP Protocol suite - The OSI model.

Introduction to Physical Layer - 1 : Data and Signals - Digital Signals - Transmission Impairment - Data Rate limits - Performance.

UNIT – II : DIGITAL TRANSMISSION.

Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding). Physical Layer-2: Analog to digital conversion (only PCM), Transmission Modes) Analog Transmission: Digital to Analog conversion.

UNIT – III : BANDWIDTH UTILIZATION.

Bandwidth Utilization: Multiplexing and Spread Spectrum – Switching : Introduction - Circuit Switched Networks - Packet switching - Error Detection and Correction: Introduction - Block coding - Cyclic codes, Checksum.

UNIT – IV : DATA LINK CONTROL.

Data link control: DLC services - Data link layer protocols - Point to Point protocol (Framing, Transition phases). Media Access control: Random Access - Controlled Access - Channelization. Introduction to Data-Link Layer: Introduction - Link-Layer Addressing - ARP. IPv4 Addressing and subnetting: Classful – DHCP – NAT.

UNIT – V : WIRED LANS ETHERNET.

Wired LANs Ethernet: Ethernet Protocol - Standard Ethernet - Fast Ethernet - Gigabit Ethernet and 10 Gigabit Ethernet. Wireless LANs: Introduction, IEEE 802.11 Project and Bluetooth. Other wireless Networks: Cellular Telephony.

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	
6	Model Lab exam	50	50	L00
7	Final Lab exam	50	50	

TEXT BOOKS

1. Behrouz A. Forouzan, Data Communications and Networking 5E, 5th Edition, Tata McGraw-Hill, 2013.

REFERENCE BOOKS

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

U20ITCT08 - IoT PROGRAMMING

Part A- Introduction of the Course

Course Code	U20ITCT08	L	T	P	C
		3	0	0	3
Course Title	IoT PROGRAMMING				
Course Category	Professional Core (C)	Contact Hrs	45		
Pre-requisite	Co- Requisite	Nil			
Name of the Course Coordinator					
Course offeringDept./School	IT / SoC				

Course Objective and Summary

- To apprise students with basic knowledge of IoT that paves a platform to understand physical, logical design and business models.
- To teach a student how to analyze requirements of various communication models and protocols for cost-effective design of IoT applications on different IoT platforms.
- To explain the students how to code for an IoT application and deploy for real-time scenario.

Course Outcomes (COs)

CO1	Describe various layers of IoT protocol stack and describe protocol functionalities.
CO2	Evaluate efficiency trade-offs among alternative communication models for an efficient IoT application design.
CO3	Comprehend advanced IoT applications and technologies from basic of IoT.
CO4	Understanding working principles of various sensor for different IoT platforms.
CO5	Estimate the cost of hardware and software for low cost design IoT applications.
CO6	Compare various applications business models of different domains.

Mapping / Alignment of COs with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2										3	3	
CO2	3	3	3										3	3	
CO3	3	3	2	3									3	3	
CO4	3	3	3	3									3	3	
CO5		3	3										3	3	
CO6		1	2	3									2	2	

(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)

U20CSCT06S	IoT PROGRAMMING	L	T	P	C
	Total Contact Periods:45	3	0	0	3
	Prerequisite –				
	Course Designed by:- Dept of Information Technology				

UNIT – I : INTRODUCTION TO IoT.

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology - IoT - Challenges and Issues.

UNIT – II : IoT ARCHITECTURE.

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - Information model - Functional model - Communication model - IoT reference architecture.

UNIT – III : IoT PROTOCOLS.

Protocol Standardization for IoT - M2M and WSN Protocols - M2M and WSN Protocols - Issues with IoT Standardization - Unified Data Standards - IEEE 802.15.4 - BACNet Protocol - ZigBee Architecture - Network Layer - IOT Security - Vulnerabilities of IoT - Security Requirements - Security Architecture for IoT.

UNIT – IV : BUILDING IoT WITH ARDUINO &RASPBERRY PI.

Building IOT with Arduino - Building IOT with RASPERRY PI - IoT Systems - Logical Design using Python - IoT Physical Devices & Endpoints - IoT Device - Building blocks – Pi - Raspberry Pi Interfaces - Pi Interfaces -Programming Raspberry Pi with Python.

UNIT – V : CASE STUDIES and REAL WORLD APPLICATIONS.

Real world Design Constraints – Applications – Asset Management, Industrial Automation, Smart grid, Commercial building automation - Smart Cities - Participatory Sensing – Data Analytics for IoT – Cloud for IoT – Amazon web services for IoT.

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	

9EXT BOOKS

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

1REFERENCE BOOKS

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach‖, Universities Press, 2015

2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols‖, Wiley, 2012 (for Unit 2).

3. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.

4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things‖, Springer, 2011.

5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011. https://www.arduino.cc/https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet.

U20ITCJ06 – ARTIFICIAL INTELLIGENCE

Part A- Introduction of the Course

The objective of this course is to impart necessary knowledge to the learner so that he/she can develop and implement algorithm and write programs using these algorithms.

Course Code	Course Category	Course Title	L 2	T 1	P 0	C 3
U20ITCT06	C	**ARTIFICIAL INTELLIGENCE**	Pre- requisite: U20ITCT01			
Name Of the Course Coordinator:		Dr.K.Ramesh kumar	Contact Hrs: 45			
Course Offering Department/School:		Department of IT	Total Marks :100			

Course Objective and Summary

These are complex real-world problems that span across various practices of engineering! Aim of artificial intelligence (AI) is to tackle these problems with rigorous mathematical tools. The objective of this course is to present an overview of the principles and practices of AI to address such complex real-world problems. The course is designed to develop a basic understanding of problem solving, knowledge representation, reasoning, learning methods of AI, natural language processing and deep learning.

Course Outcomes (COs)		BT Level
CO1	Apply the good programming skills to formulate the solutions for computational problems.	
CO2	Design and develop solutions for informed and uninformed search problems in AI.	
CO3	Utilize advanced package like NLP for implementing artificial intelligence.	
CO4	Understand the concepts of deep learning algorithms	
CO5	Apply the advanced deep learning techniques in real world application	

Mapping / Alignment of COs with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2										3	3	
CO2	3	3	3										3	3	
CO3	3	3	2	3									3	3	
CO4	3	3	3	3									3	3	
CO5		3	3										3	3	
CO6		1	2	3									2	2	

(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)

COURSE CONTENTS

UNIT - I INTRODUCTION TO AI **9**

What Is Artificial Intelligence - A Brief History of Artificial Intelligence - Types of Artificial Intelligence - How Does Artificial Intelligence Work - Ways of Implementing AI - AI Programming Cognitive Skills - Learning, Reasoning and Self- Correction - Advantages and Disadvantages of AI - Applications of Artificial Intelligence

UNIT – II AI TECHNIQUES **9**

Heuristic Search - Local Search, Genetic Algorithms - Adversarial Search - Constraint Satisfaction - Propositional Logic & Satisfiability

UNIT – III NATURAL LANGUAGE PROCESSING **9**

Introduction and Basic Text Processing - Spelling Correction, Language Modelling- syntax – Constituency Parsing - Lexical Semantics - Text Summarization, Text Classification - Sentiment Analysis and Opinion Mining

UNIT – IV DEEP LEARNING **9**

Introduction to Deep Learning - Bayesian Learning - Decision Surfaces - Linear Classifiers - Optimization Techniques - Gradient Descent - Batch Optimization - Introduction to Neural Network - Multilayer Perceptron - Back Propagation Learning - Convolutional Neural Network - Building blocks of CNN - Transfer Learning.

UNIT – V ADVANCED DEEP LEARNING **9**

Revisiting Gradient Descent - Effective training in Deep Net- Batch Normalization, Instance Normalization, Group Normalization - Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN etc. - LSTM Networks

TOTAL: 45

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	
6	Model Lab exam	50	50	L00
7	Final Lab exam	50	50	

Text Books

Reference Books

Other Resources (Online Resources or others)

U20ITCT03 – ENTERPRISE RESOURCE PLANNING AND IMPLEMENTATION

Introduction of The Course

This course serves as an introduction to the world of Enterprise Resource Planning and also provides foundation for many disciplines in common business modern information systems.

Course Code	Course Category	Course Title	L 3	T 0	P 0	C 3
U20ITCT03	C	ENTERPRISE RESOURCE PLANNING AND IMPLEMENTATION	Pre- requisite: U20PDHJ01 or Diploma			
Name Of the Course Coordinator:		Dr. K Ramesh Kumar	Contact Hrs: 45			
Course Offering Department/School:		Department of IT	Total Marks :100			

Course Objective and Summary

- Describe the concept of ERP and the ERP model; define key terms; explain the transition from MRP to ERP; identify the levels of ERP maturity.
- Explain how ERP is used to integrate business processes; define and analyze a process; create a process map and improve and/or simplify the process; apply the result to an ERP implementation.

Course Outcomes (COs)		BT Level
CO1	Develop model for ERP for large projects	3
CO2	Develop model for E-commerce architecture for any application.	3
CO3	Describe the advantages, strategic value, and organizational impact of utilizing an ERP system for the management of information	2
CO4	Demonstrate a working knowledge of how data and transactions are integrated in an ERP system to manage the sales order process, production process, and procurement process.	3
CO5	Summarize organizational opportunities and challenges in the design system within a business scenario.	4

Mapping / Alignment of COs with PO & PSO														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2												3
CO2	3	3	3												3
CO3	3	3	2	3											3
CO4	3	3	3	3											3
CO5		3	3												3
(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)															

COURSE CONTENTS

UNIT I INTRODUCTION **9**

ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP.

UNIT II BUSINESS PROCESS **9**

Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.

UNIT III ERP MARKETPLACE **9**

ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT IV ERP IMPLEMENTATION **9**

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.

UNIT V FUTURE DIRECTIVES IN ERP **9**

ERP & E-Commerce, Future Directives in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study.

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	

Text Books

1. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning Concepts and Practice”, Prentice Hall India, 2003.

Reference Books

1. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology, 2006.
2. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 2008.

U20ITCT04 HUMAN COMPUTER INTERACTION

Part A-Introduction of the Course

This course teaches students to design user interfaces based on the capabilities of computer technology and the needs of human factors. Students design a user interface for a system and implement a prototype from a list of informal requirements.

Course Code	U20ITCT04		L	T	P	C
			3	0	0	3
Course Title	**HUMAN COMPUTER INTERACTION**					
Course Category	Professional Core (C)		**Contact Hrs**		45	
Pre-requisite	U20ITCT04	**Total Marks**	100			
Name of the Course Coordinator		Ms.D.Sharmila				
Course offering Dept./School		IT / SoC				

Course Objective and Summary
• To provide the basic knowledge on the levels of interaction, design models, techniques and validations focusing on the different aspects of human-computer interface and interactions • To make the learners to think in design perspective and to evaluate interactive design • To use the concepts and principles of HCI to analyze and propose solution for real life applications 4. To become familiar with recent technology trends and challenges in HCI domain

Course Outcomes (COs)		**Bloom's Taxonomy Level**
CO1	Enumerate the basic concepts of human, computer interactions	2
CO2	Illustrate the processes of human computer interaction life cycle	3
CO3	Explain design the various interaction design models	3
CO4	Illustrate the interface design standards/guidelines for evaluating the developed interactions	3
CO5	Classify product usability evaluations and testing methods	4

Mapping / Alignment of COs with PO & PSO															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3												3	
CO2	2	2												2	
CO3	3	2												3	
CO4	2	2												2	
CO5	2	2												2	
(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)															

Course Content

UNIT 1 HCI FOUNDATIONS **9**

Input–output channels, Human memory, Thinking: reasoning and problem solving, Emotion, Individual differences, Psychology and the design of interactive systems, Text entry devices, Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction, Physical controls, sensors and special devices, Paper: printing and scanning

UNIT 2 DESIGNING INTERACTION **9**

Overview of Interaction Design Models, Discovery - Framework, Collection - Observation, Elicitation, Interpretation - Task Analysis, Storyboarding, Use Cases, Primary Stakeholder Profiles, Project Management Document

UNIT 3 INTERACTION DESIGN MODELS 9

Model Human Processor - Working Memory, Long-Term Memory, Processor Timing, Keyboard Level Model - Operators, Encoding Methods, Heuristics for M Operator Placement, What the Keyboard Level Model Does Not Model, Application of the Keyboard Level Model, GOMS - CMN-GOMS Analysis, Modeling Structure, State Transition Networks - Three-State Model, Glimpse Model, Physical Models, Fitts‟ Law - Shneideman's eight golden rules, Norman's Sever principles, Norman's model of interaction, Nielsen's ten heuristics, Heuristic evaluation, contextual evaluation, Cognitive walk-through

UNIT 4 COLLABORATION AND COMMUNICATION 9

Face-to-face Communication, Conversation, Text-based Communication, Group working, Dialog design notations, Diagrammatic notations, Textual dialog notations, Dialog semantics, Dialog analysis and design - Groupware, Meeting and decision support systems, Shared applications and artifacts, Frameworks for groupware Implementing synchronous groupware, Mixed, Augmented and Virtual Reality

UNIT 5 VALIDATION AND ADVANCED CONCEPTS 9

Validations - Usability testing, Interface Testing, User Acceptance Testing Past and future of HCI: the past, present and future, perceptual interfaces, context-awareness and perception – Recent Trends

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	

TEXT BOOKS

1. A Dix, Janet Finlay, G D Abowd, R Beale., Human-Computer Interaction, 3rd Edition, Pearson Publishers,2008

REFERENCE BOOKS

1. Shneiderman, Plaisant, Cohen and Jacobs, Designing the User Interface: Strategies for Effective Human Computer Interaction, 5th Edition, Pearson Publishers, 2010.
2. Hans-Jorg Bullinger, “Human-Computer Interaction”, Lawrence Erlbaum Associates, Publishers

U20ITCT05 – QUANTUM INFORMATION PROCESSING

Introduction of the Course

The objective of this course is to impart necessary knowledge to the learner so that he/she can develop and implement algorithm and write programs using these algorithms.

Course Code	Course Category	Course Title	L 3	T 0	P 0	C 3
U20ITCT05	C	**QUANTUM INFORMATION PROCESSING**	Pre- requisite: U20ITCJ04			
Name Of the Course Coordinator:		Dr.K.Ramesh kumar	Contact Hrs: 45			
Course Offering Department/School:		Department of IT	Total Marks :100			

Course Objective and Summary

Quantum computers have the potential to efficiently solve problems that are intractable for classical computers. This course will explore the foundation of quantum computing. As this is a multidisciplinary subject, the course will cover basic concepts in theoretical computer science and physics in addition to introducing core quantum computing topics.

Course Outcomes (COs)		BT Level
CO1	Discuss the necessity of quantum computing to real time solutions	2
CO2	Describe the mathematical foundation of quantum information processing	2
CO3	Identify the building blocks of the quantum programs	2
CO4	Understand the algorithms of quantum applications	2
CO5	Apply the major quantum toolkits to the real time applications	3

Mapping / Alignment of COs with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2									1	2	
CO2	2	3	2	2									1	2	
CO3	2	3	2	2									1	2	
CO4	2	3	2	2									1	2	
CO5	2	3	2	2									2	2	

(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)

Content of the Course

UNIT – I INTRODUCTION TO QUANTUM COMPUTING 9

Motivation for studying Quantum Computing - Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc.) - Origin of Quantum Computing - Overview of major concepts in Quantum Computing - Qubits and multi-qubits states, Bracket notation - Bloch Sphere representation - Quantum Superposition - Quantum Entanglement

UNIT – II MATH FOUNDATION FOR QUANTUM COMPUTING 9

Matrix Algebra: basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen vectors.

UNIT – III BUILDING BLOCKS FOR QUANTUM PROGRAM 9

Architecture of a Quantum Computing platform - Details of q-bit system of information representation - Block Sphere - Multi-qubits States - Quantum superposition of qubits (valid and invalid superposition) - Quantum Entanglement - Useful states from quantum algorithmic perceptive e.g. Bell State - Operation on qubits: Measuring and transforming using gates - Quantum Logic gates and Circuit: Pauli, Hadamard, phase shift, controlled gates, Ising, Deutsch, swap etc. - Programming model for a Quantum Computing Program - Steps performed on classical computer - Steps performed on Quantum Computer - Moving data between bits and qubits.

UNIT – IV QUANTUM ALGORITHMS 9

Basic techniques exploited by quantum algorithms - Amplitude amplification - Quantum Fourier Transform - Phase Kick-back - Quantum Phase estimation - Quantum Walks - Major Algorithms - Shor's Algorithm - Grover's Algorithm - Deutsch's Algorithm - Deutsch -Jozsa Algorithm

UNIT – V OSS TOOLKITS FOR IMPLEMENTING QUANTUM PROGRAM 9

IBM quantum experience - Microsoft Q - Rigetti PyQuil (QPU/QVM) - Building Quantum dice - Building Quantum Random No. Generation - Composing simple quantum circuits with q-gates and measuring the output into classical bits - Implementation of Shor's Algorithms - Implementation of Grover's Algorithm

TOTAL: 45

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	100
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	

Text Books

1. Michael A. Nielsen, "Quantum Computation and Quantum Information" , Cambridge University Press.

Reference Books

1. David McMahon, "Quantum Computing Explained" , Wiley.

Other Resources (Online Resources or others)

1. IBM Experience: https://quantumexperience,ng,bluemix.net
2. Microsoft Quantum Development Kit https://www.microsoft.com/en-us/quantum/development-kit
3. Forest SDK PyQuil: https://pyquil.readthedocs.io/en/stable/

U20ITST01 - FULL STACK DEVELOPMENT

This Course is to develop both client and server software. In addition to mastering HTML and CSS, he/she also knows how to: Program a browser (like using JavaScript, jQuery, Angular, or Vue) Program a server (like using PHP, ASP, Python, or Node).

Introduction of the Course

Course Code	U20ITST01	L	T	P	C
		3	0	0	3
Course Title	FULL STACK DEVELOPMENT				
Course Category	Professional Elective (S)	Contact Hrs	45		
Pre-requisite	U20ITCJ02	Total Marks	100		
Name of the Course Coordinator	Dr.A.Kumaravel				
Course offering Dept./School	IT / SoC				

Course Objective and Summary
To understand all the moving parts in web and mobile applications, from interface design and business logic to data management and analytics

Course Outcomes (COs)		BTL Level
CO1	Demonstrate intermediate and advanced web development practices.	3
CO2	Prepare a fully functioning website and deploy on a web server.	3
CO3	Produce JavaScript applications that transition between states.	3
CO4	Identify mobile strategies and design for multiple operating systems.	3
CO5	Differentiate trends in multi-device implementation.	4

Mapping / Alignment of COs with PO & PSO															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		3								3		
CO2	3	2	2		3								3		
CO3	3	2	3		3								3		
CO4	3	2	2		3								3		
CO5	3	2	2		3								3		
(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)															

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-

Content of The Course

UNIT I HYPERTEXT MARKUP LANGUAGE and CSS 9

Introduction to HTML - Browsers and HTML - Editor's Offline and Online - Tags, Attribute and Elements - Doctype Element – Comments - Headings, Paragraphs, and Formatting Text - Lists and Links - Images and Tables - Introduction CSS - Applying CSS to HTML - Selectors, Properties and Values - CSS Colors and Backgrounds - CSS Box Model - CSS Margins, Padding, and Borders - CSS Text and Font Properties - CSS General Topics.

UNIT II JAVASCRIPT 9

Introduction to JavaScript - Applying JavaScript (internal and external) - Understanding JS Syntax - Introduction to Document and Window Object - Variables and Operators - Data Types and Num Type Conversion - Math and String Manipulation - Objects and Arrays - Date and Time - Conditional Statements - Switch Case - Looping in JS – Functions.

UNIT III REACTJS 9

Introduction - Templating using JSX - Components, State and Props - Lifecycle of Components - Rendering List and Portals - Error Handling – Routers - Redux and Redux Saga - Immutable.js - Service Side Rendering - Unit Testing – Webpack

UNIT IV NODE-JS 9

Node js Overview - Node js - Basics and Setup - Node js Console - Node js Command Utilities - Node js Modules - Node js Concepts - Node js Events - Node js with Express js - Node js Database Access.

UNIT V MONGODB and PYTHON 9

SQL and NoSql Concepts - Create and Manage MongoDB - Migration of Data into MongoDB - MongoDB with PHP - MongoDB with NodeJS - Services Offered by MongoDB - Python Installation & Configuration - Developing a Python Application - Connect MongoDB with Python - VCS

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	100
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	

TEXT BOOKS

1. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, Apress, 2018

REFERENCE BOOKS

1. Beginning JSP, JSF and Tomcat: Java Web Development (Expert's Voice Giulio Zambon , in Java) Apress , September 2012

11. Other Resources (Online Resources or others)

- https://www.w3schools.com/whatis/whatis_fullstack.asp#:~:text=A%20full%20stack%20web%20developer,ASP%2C%20Python%2C%20or%20Node)

U20ITST02 - BIG DATA ANALYTICS AND VISUALIZATION

Introduction of the Course

This course provides an overview of the statistical tools most commonly used to process, analyze, and visualize data. Topics include describing data, statistical inference, 1 and 2 sample tests of means and proportions, simple linear regression, multiple regression, logistic regression, analysis of variance, and regression diagnostics.

Course Code	U20ITST02	**L**	**T**	**P**	**C**
		3	0	0	3
Course Title	BIG DATA ANALYTICS AND VISUALIZATION				
Course Category	Professional Elective (S)	**Contact Hrs**	45		
Pre-requisite	U20ITCJ02	**Total Marks**	100		
Name of the Course Coordinator	Ms. D. SHARMILA				

Course Objective and Summary
• Appreciate the science of statistics and the scope of its potential applications. • Select the appropriate statistical analysis depending on the research question at hand. • Form testable hypotheses that can be evaluated using common statistical analyses. • Understand and verify the underlying assumptions of a particular analysis.

Course Outcomes (COs)		**BT Level**
CO1	Build and maintain reliable, scalable, distributed systems with Apache Hadoop.	3
CO2	Understand Spark framework and explore various ML tools for data processing.	3
CO3	Apply HIVEQL, PIG techniques to solve big data queries.	3
CO4	Understand conventional SQL query language and NoSQL, query MongoDB.	3
CO5	Visualize big data to perform decision making in real world problems.	4

Mapping / Alignment of COs with PO & PSO															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2		3								3		
CO2	3	2	2		3								3		
CO3	3	2	3		3								3		
CO4	3	2	2		3								3		
CO5	3	2	2		3								3		
(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)															

1. Course Content

UNIT I BIG DATA 9

Introduction to Big Data: Distributed file system– Big data and its importance, 3Vs of Data Volume, Velocity and Variety, Data sets, Data analysis, Data analytics, Business intelligence, KPI, Big data characteristics, Different types of data, Drivers for big data adoption. Hadoop

Architecture: Overview of Distributed database Systems, Hadoop eco-system, Hadoop core components, Hadoop distributions, developing enterprise applications with Hadoop.

UNIT II HADOOP AND SPARK 9

Storing Data in Hadoop: Moving data in and out of Hadoop, HDFS architecture, HDFS files, Hadoop specific file types, HDFS federation and high availability, working with HDFS Commands, Fundamentals of HBASE and Introduction to Data Analysis with Spark, Downloading Spark and Getting Started - Programming with RDDs - Machine Learning with MLlib.

UNIT III HIVE, HIVQL and PIG 9

HIVE: Architecture and installation, Comparison with traditional database, HIVQL querying data, Sorting and aggregating, Joins & sub queries, HIVE Vs PIG, PIG: Architecture and installation, Execution Mechanisms, load/store operator, Pig scripts.

UNIT IV NoSQL and Mongo DB 9

Introduction, Types of NoSQL databases, Advantages of NoSQL, Use of NoSQL in industry, SQL VS NoSQL, MongoDB: MongoDB Support for dynamic queries, Replications, Sharding, MongoDB Query Language.

UNIT V DATA VISUALIZATION 9

Bar Charts, Histograms, Pie Charts, Scatter Plots, Line Plots, Create Database and Drop Database, Collections and Documents, Regression.

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	

TEXT BOOKS

- Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”,Wiley, ISBN: 9788126551071, 2019

REFERENCE BOOKS

- Kyle Banker,Piter Bakkum , Shaun Verch, “MongoDB in Action”, Second Edition, Dream tech Press 2016

Other Resources (Online Resources or others)

- https://www.tutorialsduniya.com/notes/data-analysis-visualization-notes/

U20ITST03 – DIGITAL FORENSICS AND ETHICAL HACKING

Part A- Introduction of the Course

The aim of this course is to equip you with the knowledge and techniques to computer forensics practices and evidence analysis. It prepares you to use various forensic investigation approaches and tools necessary to start a computer forensics investigation. It also aims at increasing the knowledge and understanding in cyber security and ethical hacking.

Course Code	U20ITST03		**L**	**T**	**P**	**C**
			3	0	0	3
Course Title	DIGITAL FORENSICS AND ETHICAL HACKING					
Course Category	Professional Elective (S)		**Contact Hrs**		45	
Pre-requisite	U20ITST01	**Total Marks**	100			
Name of the Course Coordinator		Dr.K.Ramesh kumar				

Course Objective and Summary
•

Course Outcomes (COs)		**BT Level**
CO1	Analyze and evaluate the cyber security needs of an organization.	3
CO2	Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.	3
CO3	Measure the performance and troubleshoot cyber security systems.	3
CO4	Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.	3
CO5	Comprehend and execute risk management processes, risk treatment methods, and key risk and performance indicators	4

Mapping / Alignment of COs with PO & PSO															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								3	2	2					
CO2								3	2	2					
CO3								3	2	3					
CO4								3	2	2					
CO5								3	2	2					
(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)															

Course Content

UNIT I INTRODUCTION TO COMPUTER FORENSICS 9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT II EVIDENCE COLLECTION AND FORENSICS TOOLS 9

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT III ANALYSIS AND VALIDATION **9**

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

UNIT IV ETHICAL HACKING **9**

Introduction to Ethical Hacking - Footprinting and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats - Sniffing

UNIT V ETHICAL HACKING IN WEB **9**

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers - Hacking Web Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	L00
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	

TEXT BOOKS

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, ―Computer
2. Forensics and Investigations‖, Cengage Learning, India Edition, 2016.
3. CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2015.

REFERENCE BOOKS

1. John R.Vacca, ―Computer Forensics, Cengage Learning, 2005
2. MarjieT.Britz, ―Computer Forensics and Cyber Crime: An Introduction, 3rd Edition, Prentice Hall, 2013.
3. Ankit Fadia ― Ethical Hacking Second Edition, Macmillan India Ltd, 2006
4. Kenneth C.Brancik ―Insider Computer Fraud Auerbach Publications Taylor &
5. Francis Group–2008

U20ITST05 – MACHINE LEARNING

Introduction of the Course

The objective of this course is to impart necessary knowledge to the learner so that he/she can develop and implement algorithm and write programs using these algorithms.

Course Code	Course Category	Course Title	L 3	T 0	P 0	C 3
U20ITST05	S	**MACHINE LEARNING**	Pre- requisite: U20ITCT01			
Name Of the Course Coordinator:		Dr.K.Ramesh kumar	Contact Hrs: 45			
Course Offering Department/School:		Department of IT	Total Marks :100			

Course Objective and Summary

- Acquire theoretical Knowledge on setting hypothesis for pattern recognition.
- Apply suitable machine learning techniques for data handling and to gain knowledge from it.
- Evaluate the performance of algorithms and to provide solution for various real world applications.

Course Outcomes (COs)		BT Level
CO1	Recognize the characteristics of Machine Learning techniques that enable to solve real worldproblems	3
CO2	Recognize the characteristics of machine learning strategies	3
CO3	Apply various supervised learning methods to appropriate problems	3
CO4	Identify and integrate more than one technique to enhance the performance of learning	3
CO5	Create probabilistic and unsupervised learning models for handling unknown pattern	3

Mapping / Alignment of COs with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	2	2	3	2							2
CO2	2	1	-	-	2	2		2							2
CO3	3	2	1	1			3	3							3
CO4		2	1	1		3		3							3
CO5	3	2	1	1	3	3	3								3
(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)															

CONTENT OF THE COURSE

UNIT I INTRODUCTION TO MACHINE LEARNING 9

Introduction, Components of Learning, Learning Models, Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension.

UNIT II SUPERVISED AND UNSUPERVISED LEARNING 9

Decision Trees: ID3, Classification and Regression Trees, Regression: Linear Regression, Multiple Linear Regression, Logistic Regression, Neural Networks: Introduction, Perception,

Multilayer Perception, Support Vector Machines: Linear and Non-Linear, Kernel Functions, K Nearest Neighbors. Introduction to clustering, K-means clustering, K-Mode Clustering.

UNIT III ENSEMBLE AND PROBABILISTIC LEARNING 9

Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: Random Forest Trees, Boosting: Adaboost, Stacking. Gaussian mixture models - The Expectation-Maximization (EM) Algorithm, Information Criteria, Nearest neighbour methods - Nearest Neighbour Smoothing, Efficient Distance Computations: the KD-Tree, Distance Measures.

UNIT IV REINFORCEMENT LEARNING AND EVALUATING HYPOTHESES 9

Introduction, Learning Task, Q Learning, Non deterministic Rewards and actions, temporal-difference learning, Relationship to Dynamic Programming, Active reinforcement learning, Generalization in reinforcement learning. Motivation, Basics of Sampling Theory: Error Estimation and Estimating Binomial Proportions, The Binomial Distribution, Estimators, Bias, and Variance

UNIT V GENETIC ALGORITHMS 9

Motivation, Genetic Algorithms: Representing Hypotheses, Genetic Operator, Fitness Function and Selection, An Illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning: Lamarkian Evolution, Baldwin Effect, Parallelizing Genetic Algorithms.

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	100
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	

TEXT BOOKS

1. Ethem Alpaydin, " Introduction to Machine Learning", MIT Press, Prentice Hall of India, 3rd Edition2014.
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar " Foundations of Machine Learning", MIT Press,2012.
3. Tom Mitchell, "Machine Learning", McGraw Hill, 3rdEdition, 1997.
4. MACHINE LEARNING - An Algorithmic Perspective, Second Edition, Stephen Marsland, 2015.

REFERENCE BOOKS

1. Charu C.Aggarwal, "Data Classification Algorithms and Applications", CRCPress,2014.
2. Charu C. Aggarwal, "DATA CLUSTERING Algorithms and Applications", CRC Press,2014.
3. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012
4. Jiawei Han and Micheline Kambers and Jian Pei, "Data mining Conceptsand Techniques", 3rd edition, Morgan Kaufman Publications, 2012.

Course Code	U20ITST06		L	T	P	C
			3	0	0	3
Course Title	BLOCK CHAIN TECHNOLOGIES					
Course Category	Professional Core (C)		Contact Hrs		45	
Pre-requisite	Network and Communication	Co-Requisite	Nil			
Name of the Course Coordinator						
Course offering Dept./School	IT / SoC					

Course Objective and Summary

- To understand the concepts of block chain.
- To learn about Bit coin, Cryptocurrency.
- To explore the concepts of Ethereum.
- To learn about Hyper ledger Fabric model and its architecture.
- To integrate ideas from block chain technology into projects.

Course Outcomes (COs)

CO1	Understand the basic concepts of Block Chain Technologies.
CO2	Explain the functional /operational aspects of Cryptocurrency Ecosystem.
CO3	Develop application using Ethereum.
CO4	Compute models for Block Chain Technology.
CO5	Illustrate Blockchain with IoT and track the emerging trends in Blockchain.

Mapping / Alignment of COs with PO & PSO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	2	2	3	2							2
CO2	2	1	-	-	2	2		2							2
CO3	3	2	1	1			3	3							3
CO4		2	1	1		3		3							3
CO5	3	2	1	1	3	3	3								3

(Tick mark or level of correlation: 3-High, 2-Medium, 1-Low)

UNIT – I

Introduction to Blockchain Technology – Distributed systems – The history of blockchain – Introduction to blockchain – CAP theorem and blockchain – Benefits and limitations of blockchain – Decentralization using blockchain - Methods of decentralization – Platforms for decentralization.

UNIT – II

Cryptography in Blockchain: Introduction – Cryptographic primitives – Assymetric cryptography – Public and private keys -line interface – Bitcoin improvement proposals (BIPs) – Consensus Algorithms.

UNIT – III

BitCoin - Introduction – Transactions – Structure - Transactions types – The structure of a block– The genesis block – The bitcoin network– Wallets and its types– Bitcoin payments– Bitcoin investment and buying and selling bitcoins – Bitcoin installation – Bitcoin programming and the command-line interface – Bitcoin improvement proposals (BIPs).

UNIT – IV

Ethereum - Ethereum block chain- Elements of the Ethereum block chain– Precompiled contracts – Accounts and its types – Block header- Ether – Messages – Mining - Clients and wallets – Trading and investment – The yellow paper - The Ethereum network - Applications developed on Ethereum – Scalability and security issues.

UNIT – V

Introduction to Web3 - Development Frameworks - Hyper ledger as a protocol - Reference Architecture - Hyper ledger Fabric - IoT with Block Chain - Block Chain based voting system - Medical Record Management System – Scalability - Other Challenges.

Evaluation Policy

S.No	Evaluation	Marks	Split up	Total Marks
1	Internal Assessment I	30	100/2 = 50	100
2	Internal Assessment II	30		
3	Internal Assessment III	30		
4	Assignment	10		
5	Final Exam	100	100/2 = 50	

TEXT BOOKS

1. Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd Revised edition edition. Birmingham: Packt Publishing, 2018.
2. A. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, 2016.

REFERENCE BOOKS

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.
2. A. M. Antonopoulos, Mastering bitcoin, First edition. Sebastopol CA: O‘Reilly,2015.
3. Mastering Ethereum: Building Smart Contracts and DApps by Andreas M. Antonopoulos, 1 st Edition.
4. Building Blockchain Projects by Narayan Prusty, 2017.

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