MINUTES OF MEETING OF ACADEMIC COUNCIL HELD ON 28 JUNE 2023

General

Academic Council meeting of Jaypee University of Information Technology, Waknaghat was held on 28 June, 2023 at 11.00 a.m.

The Chairman, Academic Council extended warm welcome to all the members present in the meeting and expressed thanks to outstation members Sh. Sunil Sharma, Prof. S.C. Saxena, and Prof. Lalit Kumar Awasthi for their presence in the meeting.

He also appreciated the contributions made by Prof. Karanjeet Singh, HoD Mathematics Deptt., Dr. Anupriya Kaur, HoD HSS Deptt., and Prof. Rajiv Ganguly, Deptt. of CE, the outgoing members of the Council, and welcomed the newly inducted members Prof. Rakesh Kumar Bajaj, HoD Mathematics Deptt., Dr. Amit Srivastava, HoD HSS Deptt. and Prof. Vineet Sharma, Deptt. of PMS.

Attendance

The following members were present:-

Chairman

Prof. Rajendra Kumar Sharma	Vice Chancellor, JUIT, Waknaghat

Head of the Other Institution of the Trust

Prof. S.C. Saxena	Pro-Chancellor, JIIT, Noida

Distinguished Academicians nominated by the Pro-Chancellor

Prof. Lalit Kumar Awasthi	Professor, NIT, Hamirpur, Ex-Director, NIT-Jalandhar

Industry Professionals nominated by the Pro-Chancellor

Sh. Sunil Sharma	Executive Vice Chairman, Jaiprakash Associates Ltd.

The Dean of all Faculty of the University

Prof. Ashok Kumar Gupta	Dean (Academics& Research)

Heads of the Departments / Centres of the University

Prof. P. B. Barman	HoD PMS
Prof. Sudhir Kumar	HoD BT&BI
Prof. Ashish Kumar	HoD CE
Prof. Vivek Sehgal	HoD CSE/IT
Dr. Rajiv Kumar	HoD ECE
Prof. Rakesh Kumar Bajaj	HoD Mathematics
Dr. Amit Srivastava	HoD HSS

Professors other than Heads of Departments

Prof. Sunil Kumar Khah	CoE
Prof. Vineet Sharma	Deptt. of PMS

Non-Member Secretary

Maj Gen Rakesh Bassi, SM (Retd.)	Registrar and Dean of Students

Leave of Absence, if any

The Chairman, Academic Council granted leave of absence to the following members of the Academic Council as they were not able to attend the meeting of the council due to their pre-engagements:-

Dr. Satish Kumar	Ex-Director, NIT Kurukshetra
Lt Gen Ravindra Mohan Chadha, PVSM,ABSM (Retd)	Director, Jaiprakash Power Ventures Ltd

Agenda Items

ITEM NO.1/2023-1 **CONFIRMATION OF MINUTES OF LAST MEETING OF THE ACADEMIC COUNCIL**

Minutes of the meeting of the last ACM held on 29 November 2021 were forwarded to the members and one comment on item No. 8.2 was received from Head – Civil Engineering Department regarding reconsidering title of the course. As per the comment received from Head Civil Engineering Department, title of the Professional Elective – VI Course "Machine Learning Engineering for Production" (L-T-P: 3-0-0) changed to "Machine Learning Engineering for Production Systems" (L-T-P: 3-0-0). The minutes of the last ACM as per **Annexure-1** with correction in title of the course listed at item No. 8.2 were confirmed.

ITEM NO. 2/2023-1 **ACTION TAKEN REPORT ON THE MINUTES OF THE MEETING OF THE LAST ACADEMIC COUNCIL HELD ON 29 NOVEMBER 2021**

The actions taken on the items approved in the last ACM dated 29 November 2021 were noted by the members.

ITEM NO. 3/2023-1 **APPROVAL FOR DEGREE IN ADVANCE UNDER EXTRAORDINARY CIRCUMSTANCES**

As per the earlier approved policy, Degree Scroll is prepared for students every year who have completed the award of Degree requirement as on 30 September of the year and degrees are being prepared / printed as per the Degree Scroll for the year. Names of the students who have completed the award of Degree requirement after 30 September of the year are being considered for inclusion in the Degree Scroll of next year and subsequent award of degree to the eligible students.

However, in some extraordinary circumstances, the requirement for the award of degree prior to Degree Scroll of next year has been observed under very special circumstances, *i.e.*, to pursue higher studies abroad, to take up PR abroad and to join services.

The proposed item was considered and deliberated by the Council. The Council approved the item and authorized the Chairman, Academic Council (Vice Chancellor) to process such cases following the defined procedure under very special circumstances.
The detailed procedure for processing such cases is as per **Annexure-2**.

ITEM NO. 4/2023-1 **APPROVAL FOR INCLUSION OF FATHER'S NAME AND MOTHER'S NAME IN DEGREE CERTIFICATE**

UGC vide D.O. No. 1-38/97 (CPP-II) dated 06/06/2014 notified the need of inclusion of Mother's Name and Father's Name in all the application forms / Degrees / Certificates issued by Universities and Colleges. Copy of the relevant letter of UGC is at **Annexure–3** for reference.

However, the existing approved degree formats issued by the University does not have provisions of Mother's Name and Father's name in the Degree Certificate. It was proposed to include Mother's Name and Father's Name in the Degree Certificate to be issued from 01/07/2023 onwards.

The item was considered and deliberated by the Council and inclusion of Mother's Name and Father's Name in the Degree Certificate to be issued from 01/07/2023 onwards was approved by the Council.

Considering the inclusion of Mother's Name and Father's Name in the Degree Certificates, formats of Degree Certificates be amended accordingly.

ITEM NO. 5/2023-1 **APPROVAL FOR PURSUING TWO ACADEMIC PROGRAMMES SIMULTANEOUSLY**

UGC vide D.O. No. 1-6/2007(CPP-II)(New) dated 13/04/2022 has published the guidelines for pursuing two academic programmes simultaneously. Copy of the letter and guidelines are at **Annexure–4**.
Later through D.O. No. 1-6/2007(CPP-II)(New) pt. II dated 10/01/2023 requested to implement these guidelines for the benefit of the students and to devise a mechanism through their Statutory bodies to facilitate the students to pursue two academic programmes simultaneously, as per these guidelines.

The item was considered by the Council and after deliberation; the item was approved with a condition to follow the UGC guidelines for pursuing two academic programmes simultaneously.

ITEM NO. 6/2023-1 **APPROVAL FOR ENGAGING PROFESSOR OF PRACTICE IN THE UNIVERSITIES**

UGC vide D.O. No. 9-1/2010(PS/Misc) PT-I dated 14/11/2022 conveyed the guidelines for engaging Professor of Practice in Universities to bring the industry and other professional expertise into the academic institutions through a new category of positions called "Professor of Practice". This new initiative will help to take real world practices and experiences into the class rooms and also augment the faculty resources in higher education institutions. In turn, the industry and society will benefit from trained graduates equipped with the relevant skills. The detailed guidelines for engaging Professor of Practice is at **Annexure–5.**

The Objectives, Duties and Responsibilities, General Conditions, Categories of engagement, Procedure for selecting Professor of Practice, Tenure guidelines are illustrated in the detailed guidelines.

The proposed item was considered by the Council and in principal approval for the same was accorded by the Council.

ITEM NO. 7/2023-1 **APPROVAL FOR CREATION OF SUPERNUMERARY SEATS TO ACCOMMODATE PM CARES FOR CHILDREN SCHEME IN HIGHER EDUCATION**

Secretary, UGC vide D.O. Letter No. F.2-39/2022 (CPP-II) dated 30/03/2022 conveyed regarding creation of supernumerary seats to accommodate children who have lost both their parents during the COVID pandemic to facilitate them to pursue higher education. Copy of the letter is at **Annexure–6**. Govt. of India has launched PM CARES for children scheme for such children and Ministry of women & Child Development with support from the District Magistrates of all the States / UTs are identifying such children. Such identified children will be issued PM CARES for Children Scheme 2021 certificate by the Ministry of Woman & Child Development.

In order to accommodate such children to pursue their higher education whenever they become eligible for admission to the programs, supernumerary seats equal to number of applications received of such candidates in all UG, PG & PhD programs has to be created from the Academic Session 2023-24 onwards.

The item was considered by the Council and Council approved creation of supernumerary seats equal to number of applications received under the category in all UG, PG & PhD Programs from the Academic Session – 2023-24.

ITEM NO. 8/2023-1 **APPROVAL OF RECOMMENDATIONS OF BOARD OF STUDIES (BoS) OF DEPARTMENT OF CIVIL ENGINEERING**

a) **BOARD OF STUDIES (BoS) OF DEPARTMENT OF CIVIL ENGINEERING HELD ON 21/05/2022**

Department of Civil Engineering conducted its Board of Studies (BoS) on 21/05/2022 and recommended the following for approval by the Academic Council:

I. To consider and approve the course structure and syllabus of the newly introduced BTech Program: BTech in Civil Engineering with Computer Application

The minutes of the BoS of department of Civil Engineering are at **Annexure-7**.

The proposed item was considered by the Council and council approved the same. The approved Course Structure and detailed syllabus of the courses is as per **Annexure-BoS-CE-1 dated 21/05/2022.**

b) **BOARD OF STUDIES (BoS) OF DEPARTMENT OF CIVIL ENGINEERING HELD ON 15/06/2023**

Department of Civil Engineering conducted its Board of Studies (BoS) on 15/06/2023 and recommended the following for approval by the Academic Council:

I. To consider and approve the minor revision in the course structure of

BTech in Civil Engineering.

II. To consider and approve the minor revision in the course syllabus of Building Materials and Construction (18B11CE313), Fluid Mechanics (18B11CE412), Surveying (18B11CE312), Water Resources Engineering (18B11CE414) and Design of Steel Structures (18B11CE612).

III. To consider and approve the addition of a new Professional Elective (Geoinformatics; 3-0-0-3) for BTech Civil Engineering.

The minutes of the BoS of department of Civil Engineering are at **Annexure-8**.

The proposed items were considered by the Council and Council approved the same.

The approved revised course structure of BTech in Civil Engineering is at **Annexure-BoS-CE-1 dated 15/06/2023.**

The approved minor revisions in the syllabus of Building Materials and Construction (18B11CE313), Fluid Mechanics (18B11CE412), Surveying (18B11CE312), Water Resources Engineering (18B11CE414) and Design of Steel Structures (18B11CE612) are at **Annnexure-BoS-CE-2 dated 15/06/2023**.

The approved syllabus of newly introduced Professional Elective (Geoinformatics; 3-0-0) is at **Annexure-BoS-CE-3 dated 15/06/2023**.

ITEM NO. 9/2023-1 **APPROVAL OF RECOMMENDATIONS OF BOARD OF STUDIES (BoS) OF DEPARTMENT OF BIOTECHNOLOGY / BIOINFORMATICS**

a) **BOARD OF STUDIES (BoS) OF DEPARTMENT OF BIOTECHNOLOGY / BIOINFORMATICS HELD ON 21/05/2022**

Department of Biotechnology / Bioinformatics conducted its Board of Studies (BoS) on 21/05/2022 and recommended the following for approval by the Academic Council:

I. To consider and approve of detailed syllabus of courses to be offered in 2nd year of M.Sc. Microbiology Program.

II. To consider and approve modifications in the syllabus of "Microbial Genetics and Physiology" (21MS1MB212), a course in the 2nd semester of MSc Microbiology.

III. To consider and approve interchange of elective courses; Computational Systems Biology (Course Code 21MS2MB313; Credits 3) from 3rd to 4th semester, and Microbial Toxicology (Course Code 21MS2MB411, Credits 3) from 4th to 3rd semester in MSc Microbiology second year curriculum.

IV. To consider and approve inclusion of two new courses on Artificial Intelligence and Data Analytics from the Department of Computer Science in the VII and VIII semester of B. Tech. Bioinformatics Program, in the existing Elective baskets.

The minutes of the BoS of department of Biotechnology / Bioinformatics are at **Annexure-9.**

The proposed items were considered by the Council and council approved the same.

The approved syllabus of courses of 2nd year of M.Sc. Microbiology Program are

at **Annexure-BoS-BT-BI-1 dated 21/05/2022.**

The approved syllabus of "Microbial Genetics and Physiology" (21MS1MB212) is at **Annexure-BoS-BT-BI-2 dated 21/05/2022.**

The approved restructuring of Elective Courses of MSc Microbiology Program is at **Annexure-BoS-BT-BI-3 dated 21/05/2022.**

The approved inclusion of new courses in 7th & 8th Semester of BTech Bioinformatics Program and approved syllabus of the courses are at **Annexure-BoS-BT-BI-4 dated 21/05/2022.**

b) BOARD OF STUDIES (BoS) OF DEPARTMENT OF BIOTECHNOLOGY / BIOINFORMATICS HELD ON 03/03/2023

Department of Biotechnology / Bioinformatics conducted its Board of Studies (BoS) on 03/03/2023 and recommended the following for approval by the Academic Council:

I. To approve the modification in the course "Environmental studies" taught in second year of BTech program of all Branches as per UGC, NEP.
II. To consider and approve initiating a Certificate course on "Industrial Plant Tissue Culture" and its contents.

The minutes of the BoS of department of Biotechnology / Bioinformatics are at **Annexure-10**.

The proposed items were considered by the Council and council approved the same.

The approved syllabus of "Environmental Studies" is at **Annexure-BoS-BT-BI-1 dated 03/03/2023.**

The approved Certificate course on "Industrial Plant Tissue Culture" and its contents are at **Annexure-BoS-BT-BI-2 dated 03/03/2023.**

ITEM NO. 10/2023-1 APPROVAL OF RECOMMENDATIONS OF BOARD OF STUDIES (BoS) OF DEPARTMENT OF PHYSICS AND MATERIALS SCIENCE

Department of Physics and Materials Science conducted its Board of Studies (BoS) on 16/06/2023 and recommended the following for approval by the Academic Council:

I. To consider the revision in the course syllabus of six (06) courses offered by Department of Physics & Materials Science.
II. To consider and approve the three new Open Electives (Biomaterials, Biosensors and Computational Nanotechnology) during 8th Semester.

The minutes of the BoS of department of Physics & Materials Science are at **Annexure-11.**

The proposed items were considered by the Council and council approved the same.

The approved revised syllabus of six (06) courses offered by Department of Physics & Materials Science are at **Annexure-BoS-PMS-1 dated 16/06/2023.**

The approved three new Open Electives (Biomaterials, Biosensors and Computational Nanotechnology) and syllabus of the new courses are at **Annexure-BoS-PMS-2 dated 16/06/2023**.

ITEM NO. 11/2023-1 **APPROVAL OF RECOMMENDATIONS OF BOARD OF STUDIES (BoS) OF DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES**

a) **BOARD OF STUDIES (BoS) OF DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES HELD ON 15/02/2023**

Department of Humanities & Social Science conducted its Board of Studies (BoS) on 15/02/2023 and recommended the following for approval by the Academic Council:

I. BTech Minor (20 Credits) in Finance and Marketing.
II. Introduction of Mandatory UHV II Course (3 Credit) in second semester along with BTech minor in UHV

The minutes of the BoS of department of Humanities & Social Science are at **Annexure-12.**

The proposed items were considered by the Council and council approved the same.

The approved Course Structure of Minor in Finance and Marketing to be offered by department of HSS are at **Annexure-BoS-HSS-1 dated 15/02/2023**.

The approved syllabus of mandatory course of Universal Human Values – II (03 Credits) to be offered in BTech 2nd Semester is at **Annexure-BoS-HSS-2 dated 15/02/2023.**

b) **BOARD OF STUDIES (BoS) OF DEPARTMENT OF HUMANITIES & SOCIAL SCIENCES HELD ON 19/06/2023**

Department of Humanities & Social Science conducted its Board of Studies (BoS) on 19/06/2023 and recommended the following for approval by the Academic Council:

I. To review and approve the Course Structure of newly introduced BBA Program.
II. To review and approval of detailed syllabi of BBA 1st year courses.
III. Restructuring of 04 courses offered by HSS department for all branches of BTech 2nd & 3rd Semester, as core courses.
IV. To consider "Centre for Management Studies" under the Department of Humanities and Social Sciences.
V. Minor revision in course contents of 02 courses (I Sem – Core Courses) and 2 Open Elective Courses (VIII Sem) for BTech, offered by HSS Department

The minutes of the BoS of department of Humanities & Social Science are at **Annexure-13.**

The proposed items were considered by the Council and council approved the same.

The approved Course Structure of newly introduced BBA Program is at

Annexure-BoS-HSS-1 dated 19/06/2023.

The approved syllabus of BBA 1st Year Courses are at **Annexure-BoS-HSS-2 dated 19/06/2023**.

The approved restructuring of 04 courses offered by HSS department for BTech 2nd & 3rd Semester is at **Annexure-BoS-HSS-3 dated 19/06/2023**.

Centre for Management Studies under the Department of Humanities and Social Sciences approved by the Council.

The approved revised syllabus of 02 Core Courses of 1st Semester and 02 Open Elective Courses of 8th Semester offered by HSS Department are at **Annexure-BoS-HSS-4 dated 19/06/2023**.

ITEM NO. 12/2023-1 **SEAT RATIFICATION FOR ACADEMIC SESSION 2023-24**

Seat intake for various courses for the Academic Session – 2023-24 was proposed for approval of the Academic Council. The Council considered the proposal and approved the following for the Academic Session – 2023-24:

Undergraduate Programs (BTech)

Program	**Approved Intake for AS-2023-24**
Computer Science & Engineering (CSE)	390#
Information Technology (IT)	60*
Civil Engineering (CE)	30
Civil Engineering with specialization in Computer Science (CECS)	30
Biotechnology (BT)	30
Bioinformatics (BI)	30
Electronics & Communication Engineering (ECE)	30
Electronics & Communication Engineering with specialization in Computer Science (ECS)	30
Total	**630**

#Including 03 new specializations: (i) CSE with specialization in Artificial Intelligence & Machine Learning(CSE-AI&ML), (ii) CSE with specialization in Artificial Intelligence and Data Science(CSE-AI&DS),and (iii) CSE with specialization in Cyber Security(CSE-CS).

**Including 02 new specializations: (i) IT with specialization in Artificial Intelligence & Machine Learning(IT-AI&ML),and (ii) IT with specialization in Artificial Intelligence & Data Science(IT-AI&DS).*

Undergraduate Programs

Program	**Proposed Intake for AS-2023-24**
BSc (Hons.) in Mathematics & Computing	30
BBA	**30**

Post Graduate Programs (MSc)

Program	**Approved Intake for AS-2023-24**
Biotechnology	30
Microbiology	30
Physics	**30**
Total	**90**

Post Graduate Programs (MTech)

Program	**Approved Intake for AS-2023-24**
Computer Science & Engineering (CSE)	18
CSE with specialisation in Information Security	
CSE with specialisation in Data Science	
Electronics & Communication Engineering (ECE)	18
ECE with specialisation in Internet of Things	
Biotechnology	18
Construction Management	18
Structural Engineering	
Environmental Engineering	
Total	**72**

Note: *PG Program (MTech) seat intake for each department will be 18 seats. A program will run with 5 or more students only.*

Doctoral Programs (PhD)

Program	**Approved Intake for AS-2023-24**
Computer Science & Engineering	Seats subject to availability of Supervisor in each department.
Civil Engineering	
Biotechnology	
Bioinformatics	
Electronics & Communication Engg	
Mathematics	
Physics & Materials Science	
Humanities & Social Sciences	

The proposal for introduction of new academic programs and increase in the sanctioned intake of the existing programs were approved by the Chairman – Academic Council vide approval dated 23/02/2023. Copy of the approval is appended at **Annexure–14**

However, Academic Council approved the item with small modifications as listed above in deferment to earlier approval by the Chairman – Academic Council.

ITEM NO. 13/2023-1 **TO REVIEW AND EXTEND THE RESERVATION OF SEATS AND TUITION FEE CONCESSION FOR WARDSOF ARMED FORCES / PARAMILITARY FORCES PERSONNEL / PERSONS WITH DISABILITY AND WARD WIDOWS**

Reservation of 10% seats and concession in Tuition Fee was allowed for the wards of serving / retired armed forces / Paramilitary forces personnel (@30% of tuition fee) and for persons with disability and war widows (@35% of tuition fee) commencing from AY-2019-20 for the duration of 05 years, *i.e.,* upto AY-2023-

24.

The item for allowing further extension to the Reservation Policy and Tuition Fee concession under the policy beyond AY-2023-24 was proposed for review and decision by the Council. The proposed item was deferred by the Council and review of the same shall be done next year after analysing the admissions in this category.

ITEM NO. 14/2023-1 **REPORTING ITEMS**

The following Reporting Items were noted by the Academic Council:-

14.1 REVISION IN PARENT'S INCOME SLAB FOR AWARD OF WILLIAM WEBSTER MERIT-CUM-MEANS SCHOLARSHIP FROM 2022-23 ADMITTED BATCH

Chairman Academic Council apprised the members about the decision taken towards the revision in Parent's Annual Income Slab for award of William Webster Merit-Cum-Means Scholarship from 2022-23 (Fresh cases) admitted batch from 1.5 Lacs per annum to 8.0 Lacs per annum considering the revised income slab for the Economically Weaker Section (EWS) category notified by Central Govt. However, there is no change in the annual income slab for the Parent's of the students continuing award of scholarship for the subsequent years.

Copy of the approval dated 27/02/2023 by Chairman – Academic Council is as per **Annexure – 15**.

14.2 TUITION FEE AND HOSTEL CHARGES FOR INTERNATIONAL STUDENTS

Chairman Academic Council apprised the members about the Tuition Fees and Hostel Charges for International students. The issue of Tuition Fees and Hostel Charges for international students was also deliberated in the Heads meeting held on 28/12/2022, chaired by the Vice Chancellor. It was unanimously agreed to adopt the Tuition Fees and Hostel charges for International students as approved for JIIT Noida. The adopted Tuition Fee and Hostel charges for international students is as under:

Programs	Tuition Fees (per annum) (in USD)	Hostel Charges (per annum) (in USD)
BTech Programs	11600 USD	3000 USD
MTech Programs	5000 USD	3000 USD
MSc Programs	3000 USD	3000 USD
PhD Programs	3000 USD	3000 USD

50% Discount in Tuition Fee amount for students of SAARC Nations.

14.3 REGISTRATION OF UNIVERSITY AND STUDENTS ON ACADEMIC BANK OF CREDITS – AN INITIATIVE TOWARDS IMPLEMENTATION OF NATIONAL EDUCATION POLICY-2020

Chairman Academic Council apprised the members about the Registration of University and Students on Academic Bank of Credits – an initiative towards implementation of National Education Policy-2020 in compliance to UGC (Establishment and Operation of Academic Bank of Credits in Higher Education) Regulations, 2021 published

in Gazette of India on 28/07/2021 – **Annexure-16**.

JUIT has registered with the Academic Bank of Credits and students admitted in Academic Year 2021-22 onwards have been asked to create ABC ID through the Portal. Out of total 927 Nos. of students, 904 Nos. of students have registered themselves on the portal as on 08/06/2023. This has been done post approval dated 26/12/2022 by the Chairman – Academic Council. Copy of the approval is at **Annexure-17**.

14.4 ADMISSION STATUS – ACADEMIC SESSION 2022-23

Members were apprised of the admission status for the Academic Session 2022-23 as on 30/11/2022. The sanctioned strength vis-a-vis admission status as on 30/11/2022 is as under:-

UG Programs (BTech)	Sanctioned	Admitted
Computer Sc. & Engg.	360	357
Information Technology	60	45
Electronics & Comm. Engg.	30	04
Electronics & Computer Engg.	30	-
Civil Engineering	30	04
Civil Engineering with Computer Application	30	02
Biotechnology	30	31
Bioinformatics	30	13
Total	**600**	**456**

PG Programs (MTech)	Sanctioned	Admitted
Computer Science & Engineering CSE (Information Security) CSE (Data Science)	18	04
Electronics & Communication Engineering ECE (Internet of Things)	18	02
Biotechnology	18	02
Civil (Construction Management) Civil (Structural Engineering) Civil (Environmental Engineering)	18	07
Total	**72**	**15**

PG Programs (MSc)	Sanctioned	Admitted
Biotechnology	30	21
Microbiology	30	04
Total	**60**	**25**

Doctoral Programs (PhD)	Sanctioned	Admitted (till date)
Computer Science & Engineering	-	02
Civil Engineering	-	04
Biotechnology	-	01
Bioinformatics	-	-
Electronics & Communication Engg	-	02
Mathematics	-	02
Physics & Materials Science	-	01

Humanities & Social Sciences	-	-
Total	**-**	**12**

14.5 LIST OF SUBJECT EXPERTS FOR FACULTY SELECTION

Members were apprised about the approved list of subject experts for Faculty selection. Departments identified the subject experts for the selection of the faculty in their respective department and the list was proposed to the Chairman – Academic Council for approval. The proposed list was considered by the Chairman – Academic Council and same was approved vide approval dated 13/12/2022.

Copy of the approval and approved list of the subject experts is at **Annexure–18**.

14.6 POLICY DOCUMENTS

Chairman apprised the members about the approval of some policy documents in order to streamline the process of the various activities and considering requirements of various Regulatory bodies. The prepared 11 Policy Documents are as under:

1. Code of Ethics for Research
2. Consultancy Policy
3. Divyangjan Policy & Initiatives
4. e-Governance Policy
5. IT Policy
6. Library Policy (Manual)
7. Policy for Promotion of Research
8. Policy on Class Rooms
9. Policy on Guest Room
10. Policy on Laboratory Maintenance
11. Sports Policy

All the above policy documents have been approved by the Chairman – Academic Council. Copy of the approval **Annexure-19** and approved Policy Documents are appended as **Annexure–20 to 30**

14.7 AWARD OF PROFICIENCY CERTIFICATE FOR 2022 PASSED OUT BATCH

Chairman apprised the members about the award of Proficiency Certificate for 2022 passed out batch students.

The provisions of Proficiency Certification was introduced / floated from the 2018 Admission batch. First batch to which proficiency was offered completed the degree requirements in June 2022 along with the opted proficiency in the chosen filed.

Students who have opted for the proficiency and met the award of proficiency conditions have been awarded with the Proficiency Certificate. Sample of the awarded Proficiency Certificate is attached at **Annexure–31**.

14.8 MODIFICATION IN COURSE STRUCTURE OF MSc (BIOTECHNOLOGY)

PROGRAM

Chairman apprised the members about the modifications in Course Structure of MSc (Biotechnology) Program.

The said modifications were proposed in the MSc 3rd Semester as under:

- Clubbing of Courses "Critical Review of Classical Papers" and "Project Proposal Presentation" as a one course "Review of Classical Paper & Project Proposal Presentation (02 Credits) (22MS1BT311)

- Introduction of one new course "Food Biotechnology (02 Credits) (22MS1BT311)

The proposed modifications have been approved by the Chairman – Academic Council vide approval dated 21/04/2023. Copy of BoS Minutes, approval and detailed syllabus of newly introduced course "Food Biotechnology" (22MS1BT311) is as per **Annexure–32**.

14.9 APPROVAL FOR COURSE STRUCTURE (1ST & 2ND SEMESTER) AND DETAILED SYLLABI COURSES OF 1ST & 2ND SEMESTER OF BSc (HONS.) IN MATHEMATICS & COMPUTING

Chairman – Academic Council apprised the members about the approval of the Course Structure (1st & 2nd Semester) and detailed syllabi of courses of 1st & 2nd Semester – BSc (Hons.) in Mathematics & Computing.

The proposed Course Structure and detailed syllabi of the courses were proposed through the Board of Studies (BoS) meeting held on 08/06/2022. (Minutes of BoS at **Annexure-33**).

The approved Course Structure is at **Annexure–34** and detailed syllabi of the courses are at **Annexure–35**.

Recommendations of the BoS of the department were considered by the Chairman – Academic Council and same were approved vide approval dated 04/10/2022. Copy of the approval by Chairman – Academic Council is at **Annexure–36**.

14.10 FLOATING OF NEW COURSE "APPLIED SOFT COMPUTING TECHNIQUES" (22P1WMA231) TOWARDS PhD COURSE WORK – DEPTT. OF MATHEMATICS

Chairman – Academic Council apprised the members about the introduction of new course towards the course work for the PhD Program.

Department of Mathematics through its Board of Studies held on 30/12/2022 (Minutes of BoS at **Annexure-37**) proposed for introduction of new course towards the course work for the PhD Program. The newly proposed course is as under:
Applied Soft Computing Techniques (22P1WMA231) (L-T-P) (3-0-0) (03 Credits)

The proposal of introduction of new course was approved by the Chairman – Academic Council vide approval dated 02/03/2023. Copy of approval and detailed syllabus of newly introduced course "Applied Soft Computing Techniques" (22P1WMA231) are at **Annexure–38**.

14.11 FLOATING OF NEW OPEN ELECTIVE COURSES BY DEPARTMENT OF CIVIL ENGINEERING

Chairman – Academic Council apprised the members about the introduction of two (02) new Open Elective Courses offered by Department of Civil Engineering Department.

Department of Civil Engineering through its Board of Studies held on 21/05/2022 (Minutes of BoS at **Annexure-39**) proposed for introduction of new Open Elective Course for BTech Program. The newly proposed courses are as under:

- Perennial Power Structures (22B1WCE731) (L-T-P) (3-0-0) (03 Credits)
- Disaster Risk Analysis and Management (22B1WCE831) (L-T-P) (3-0-0) (03 Credits)

The proposed introduction of Open Elective Courses was approved by the Chairman – Academic Council vide approval dated 22/10/2022. Copy of approval and detailed syllabus of newly introduced courses are as per **Annexure–40**.

14.12 REPRINTING OF DEGREE CERTIFICATES DUE TO SPELLING ERROR IN NAME

Chairman – Academic Council apprised the members about the reprinting of two (02) Degree Certificates due to spelling error in name printed on the Degree certificate in respect of below mentioned students:-

Ms. Suchi Johari, Enrolment No. 132208 – MTech (CSE)

Ms. Shivani Sood, Enrolment No. 106558 – PhD (Biotechnology)

Noting for change in the name and reprinting of the degree was moved to the Chairman – Academic Council and upon approval by the Chairman – Academic Council, reprinting of the degrees was done with correct name. The earlier printed Degree certificate having spelling error in name were called back and cancelled. Copy of the approval Chairman – Academic Council and reprinted Degree certificates are appended at **Annexure–41**.

ITEM NO. 15/2023-1 ANY OTHER ITEM WITH THE PERMISSION OF THE CHAIR

15.1 APPROVAL FOR POST DOCTORATE FELLOWSHIP RULES

In order to improvise and enhance the academic standards of the Institution, it was proposed to devise the mechanism for induction of Post Doctorate Fellows and implementation of Post Doctorate Fellowship Programmes for induction of such Post Doctorate Fellows. Such induction will translate to better research environment, perception of the institution and may bring higher accolades to the

Institution under NIRF rankings.

In order to attain the above objective, it was proposed to frame proper rules and regulations for offering post doctorate fellowship to the prospective candidates.

The item was considered by the Council and after deliberation item was approved.

The approved Post Doctorate Fellowship Rules are as per **Annexure-42**.

There being no other point, meeting ended with a vote of thanks to the Chair.

(Maj Gen Rakesh Bassi, SM (Retd))
Registrar & Non-Member Secretary

Confirmed

(Prof Rajendra Kumar Sharma)
Chairman, Academic Council&
Vice-Chancellor, JUIT, W

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY
(Established by H.P. State Legislative vide Act No. 14 of 2002)
P.O. Waknaghat, Teh.Kandaghat, Distt. Solan-173234 (H.P.) INDIA
Website: www.juit.ac.in
Phone No. +91-01792-257999 (30 Lines)
Fax : +91-01792-245362

Revision of Syllabus during Last Five Years

Programme Code	Programme name	Year of Introduction	Status of implementation of CBCS / Elective Course System (ECS)	Year of implemetation of CBCS / Elective Course System (ECS)	Year of revision (if any)	If revision has been carried out in the syllabus during last 5 years, Percentage of content added or replaced
BTBI	BTech Bioinformatics	2002	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS: 2002**	**2018, 2021**	**100**
BTBT	BTech Biotechnology	2005	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS: 2005**	**2018, 2021**	**100**
BTCE	BTech Civil Engineering	2003	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS: 2003**	**2018, 2021**	**100**
BTECE	BTech Electronics & Communication Engineering	2002	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS: 2002**	**2018, 2021**	**100**
BTCSE	BTech Computer Science Engineering	2002	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS: 2002**	**2018, 2021**	**100**
BTIT	BTech Information Technology	2002	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS: 2002**	**2018, 2021**	**100**

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Jaypee University of Information Technology * Waknaghat * Dean (A&R)

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BTECE	BTech Electronics & Computer Engineering	2021	**CBCS : Yes ECS: Yes**	**CBCS: 2021 ECS: 2021**		
BTCEC	BTech Civil Engineering with Computer Applications	2022	**CBCS : Yes ECS: Yes**	**CBCS: 2022 ECS: 2022**		
MTCE	MTech Civil Engineering	2011	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS:2011**	**2019**	**24**
MTCSE	MTech Computer Science & Engineering	2004	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS:2004**	**2019**	**24**
MTECE	MTech Electronics & Computer Engineering	2005	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS:20005**	**2019**	**24**
MSBT	MSc Biotechnology	2019	**CBCS : Yes ECS: Yes**	**CBCS:2019 ECS:2019**	**2020**	**90**
MTBT	MTech Biotechnology	2003	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS: 2003**	**2021**	**15**
MSMB	MSc Microbiology	2021	**CBCS : Yes ECS: Yes**	**CBCS:2021 ECS:2021**	**2022**	**20**
PHD	PhD	2003	**CBCS : Yes ECS: Yes**	**CBCS:2017 ECS:2003**	**2022**	**60**

Prof. Ashok K. Gupta
(Dean A&R)

Jaypee University of Information Technology * Waknaghat * Dean (A&R)

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GUIDELINES FOR REVISION OF COURSES

The curriculum review process is designed to ensure the integrity of curricula and credit-bearing courses offered by university. The major modifications can be done not before 3 years. Before doing the revisions the feedback from the following (at least 5-6) should be considered:

1. Action taken on recommendations of previous BoS.
2. Feedback from students.
3. Feedback from Stake holders.
4. Syllabi of competitive exams like IES, GATE, and IAS.
5. Visits of faculty to industry.
6. Information from the company's campus interview.
7. Feedback / Suggestions from faculty.
8. Chair Professor Industry-University Interaction.
9. Rules & regulations of governing, funding, accreditation and monitoring bodies.
10. Scheme of courses/curriculum prevalent in other university/universities of National & International repute.
11. Feedback from IQAC.

Later it was approved from the following bodies:

1. Discussing the feedback in faculty meeting and proposing the changes to be taken by Program Curriculum and Evaluation Committee.
2. Discussions in the meetings of Program Curriculum and Evaluation Committee.
3. Bench marking with IIT/NIT.
4. Board of Studies.
5. Academic Council.

Prof. Ashok K. Gupta
(Dean A&R)

Prof. Ashok Kumar Gupta
PhD, IIT, Delhi
Dean (Academics & Research)
Jaypee University of Information Technology,
Waknaghat, Distt.-Solan (HP) 173234 India

Metric 1.1.2 (Syllabus Revision)			
S.No.	**Course Code**	**Course Name**	**Year of Revision**
1	22B1WHS831	Intercultural Communication	2022-23
2	22B1WHS832	International Human Resource Management	2022-23
3	21B11HS111	English course	2022-23
4	21B17HS271	English Lab	2022-23
5	21MS1MB212	Microbial Genetics and Physiology	2022-23
6	18B11GE411	Environmental Studies	2022-23
7	18B11PH111	Engineering Physics I	2022-23
8	18B11PH211	Engineering Physics II	2022-23
9	18B11PH112	Basic Engineering Physics I	2022-23
10	18B11PH212	Bioinstrumentation Techniques	2022-23
11	18B1WPH531	Science and Technology Materials	2022-23
12	18B1WPH532	Applied Material Science	2022-23
13	18B11CE313	Building Materials and Construction	2022-23
14	18B11CE412	Fluid Mechanics	2022-23
15	18B11CE312	Surveying	2022-23
16	18B11CE414	Water Resources Engineering	2022-23
17	18 B11CE612	Design of Steel Structures	2022-23
18	21BWMA831	Soft Computing and Optimization Algorithms	2022-23
19	18B11MA411	Biostatistics	2022-23
20	18B17MA471	Biostatistics Lab	2022-23

English (Proposed)

COURSECODE: 21B11HS111
COURSE CREDITS: 2
CORE/ELECTIVE: CORE
L-T-P: 2-0-0

Course Objectives

1. The students will be able to analyze different communication situations to make choices about the mosteffective and efficient ways to communicate.
2. The student will learn to deliver effective presentations in contexts that may require power point,extemporaneous or impromptu oral presentations.
3. The student will learn to write effective technical documents using appropriate style.
4. The student will learn to design effective resumes, and write effective emails, letters and reports
5. Students will develop command over their language and synchronize their thoughts into written form

Course Outcomes:

S. No	Course Outcomes	Level of Attainment
CO-1	Understand and learn the concepts of better and effective communication	**Familiarity**
CO-2	Enable students to prepare better Power Point Presentations with clarity of expression and appropriate language.	**Assessment**
CO-3	Help make communication better by learning the nature and mechanics of effective writing	**Assessment**
CO-4	Design effective resumes, and write effective emails, letters and reports	**Usage**
CO-5	Understand different workplace scenarios and communicate accordingly in diverse communicative situations	**Assessment**

Course Contents:

Sr. No	Topic/Module	Contact Hours (28)
1	**Workplace Communication: Meaning and Importance** • Importance of communicating effectively: Theories of communication • Understanding interpersonal Communication: The Johari Window Model • Stages of communication: Ideation, encoding, transmission, decoding & response • Feedback in organizations • Barriers to effective communication: Physical, Social, Psychological, Cultural, Language & organizational • Guidelines to overcome communication barriers	**6**
2	**Listening Skills & Nonverbal Communication and Body Language** **(i) Listening** • Empathetic Listening and its importance in leadership communication • Process and Principles of Listening • Types of Listening • Barriers to listening **(ii) Nonverbal Communication** • Nonverbal communication and body language defined • Functions of nonverbal communication and Body Language: Conveying meanings,	**6**

	expressing emotion, presenting self, managing interactions, defining relationship • Nonverbal Communication Codes: Communicating through Body Movements, Voice, Touch, Personal Space, Time, Physical Appearance	
3	**Intercultural Communication: An Introduction** • Intercultural Communication in a globalized world • Language, Communication, and Culture • Nonverbal Communication and Culture • Intercultural Communication Competence	**3**
4	**Effective Presentation Skills** • Planning Presentations • Making PowerPoint presentations • Pre- presentation jitters • Preparation and Practice • Delivering the Presentation • Handling Questions	**5**
5	**Communication Strategies & Professional Writing** • Principles of Technical Writing • Writing Process: Pre-writing, writing & post-writing • Neutral, positive, Negative messages and Persuasive messages • Letters, Emails • Resume and Cover Letter **Report Writing** • Functions of a report • Types of reports • Format of the reports • Use of Visuals-Charts, Tables, Pictures	**8**

***Highlighted portions have been added**

Methodology

The course will follow an interactive teaching-learning method with classroom discussions and activities on fundamental concepts of communication with emphasis on skill development of students with regard to speaking, writing, logically interpreting ideas and reasoning.

Evaluation

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour	Syllabus covered up to T-1
2	T-2	25	1.5 Hours	Syllabus covered up to T-2
3	T-3	35	2 Hours	Entire Syllabus
4	TA	25	Entire Semester	Assignment (5) Resume Writing (10) Public Speaking (5) Attendance (5)
	Total	100		

1. Text Books:

Guffey, M.A. (2000). *Business Communication: Product & Process*. South-Western College

Publishing.Lesikar,R.V., Flatley, M.E., Rentz, K. & Pande, N.(2009). *Business communication.*

McGraw Hill.

2. Reference Books

Murphy, Herta A., Hildebrandt, Herbert; Thomas, Jane. (2008). *Effective Business Communication*. TataMcgraw Hill.

Williams, K., Krizan, A.C., Logan, J. & Merrier, P. (2011). *Communicating in Business*. Cengage Learning.

Attainment of POs through COs													
Sr No	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	AVG
CO-1	1	3	3	3	1	2	3	3	3	3	1	3	2.4
CO-2	1	2	3	2	1	1	2	3	3	3	1	3	2.0
CO-3	1	1	3	2	2	2	1	2	3	3	1	3	2
CO-4	1	2	2	3	2	1	1	3	2	3	1	3	1.9
CO-5	1	2	3	2	2	2	1	3	2	3	1	3	2.0
Average Score	1	2	2.6	2.3	1.6	1.6	1.5	2.8	2.5	3	1	3	2

English Lab (Proposed)

COURSE CODE: 21B17HS171

COURSE CREDITS: 1

CORE/ELECTIVE: CORE

L-T-P: 0-0-2

Pre-requisite: None

Course Objectives:

1. The students will learn to speak and write grammatically correct sentences with the ability to expressthoughts with clarity and accuracy.
2. The students will learn the rules of grammar in writing. It will enhance their ability to use logicalsequencing while writing any business letter or document.
3. The students will learn using new words and build their vocabulary steadily and systematically byfollowing lab exercises.
4. Students will develop command over their language and synchronize their thoughts while writingdifferent types and kinds of Business letters.
5. Students will be groomed to develop the art of speaking logically, confidently and pragmatically whichinvolves understanding work ethics and manners and the correct use of body language.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO1	Understand and sharpen writing skills usingcorrect grammar in Emails, Business letters and Report writing.	Usage and Assessment
CO2	Help make communication stronger by learning Non verbal cues and correct Body Language.	Familiarity and Assessment
CO3	Enable students to prepare better Power Point Presentations with clarity of expression andappropriate language.	Familiarity and Assessment
CO4	Develop advanced vocabulary by learning touse different ways of word construction and	Usage and Assessment

	strategies of learning new words.	
CO5	Learn about the ethics of writing and differenttypes of formats in documents with command over language.	Usage and Assessment

List of Exercises

Lab Exercise No.	Subtitle of the Module	Topics	Hours
1.	**Software: Tense Buster**	The students will take the 'Test Your Level' Test on the Software and start with the respective Exercise as per the level achieved **Exercises:** Elementary Level: Am, is, are (to be)Pre-Intermediate Level: ComparisonsIntermediate Level: The passive Upper Intermediate Level: Present Perfect Advanced Level: Past perfect	1
2.	**Software: Tense Buster**	**Exercises:** Elementary Level: Simple present Pre-Intermediate Level: Simple present Intermediate Level: Will and going to Upper Intermediate Level: Past continuous Advanced Level: Reported speech	1
3.	**Software: Tense Buster**	**Exercises:** Elementary Level: Negatives (I don't go) and Questions (does he?) Pre-Intermediate Level: Present continuousIntermediate Level: Question tags Upper Intermediate Level: Adjectives and adverbsAdvanced Level: Phrasal verbs	1
4.	**Software: Tense Buster**	**Exercises:** Elementary Level: Countable? and Some, any Pre-Intermediate Level: Present perfect Intermediate Level: Equality Upper Intermediate Level: Modal verbsAdvanced Level: Nouns	1
5.	**Software: TenseBuster**	**Exercises:** Elementary Level: I, my, me, A, an, thePre-Intermediate Level: Simple past Intermediate Level: Relative clauses Upper Intermediate Level: The future Advanced Level: The passive	1
6.	**Software: Tense Buster**	**Exercises:** Elementary Level: Have got (InternationalEnglish version only) Pre-Intermediate Level: PrepositionsIntermediate Level: Conditionals Upper Intermediate Level: ConditionalsAdvanced Level: Articles	1

7.	**Software:Practical Writing**	**Essays: For and Against** What will I learn? Stages of writing Brainstorming (1) Brainstorming (2) Planning your essay (1) Choosing a styleQuick quiz: the Writing Process Lab work: First and Final Draft	1
8.	**Software: Practical Writing:**	**Essays: Descriptive:** What will I learn?, Planning your essay (1), Planning youressay (2), Words and senses (1), Vocab focus: choosing precise words, Linking ideas (1), Linking ideas (2), Quick quiz: descriptive essays	1
9.	**Software: PracticalWriting**	**A Short Report Graphs (I):** What will I learn in this unit? A report on graph, Choosingtenses (1), Choosing tenses (2), Write a report (1), Prepositions of time (1), Describing differences (1), Quickquiz: A report on graphs, Lab work: Report writing from graph	1
10.	**Software : Practical Writing**	**A Short Report: Hotel and restaurants (II)**: What will I learn? Restaurant reviews: structure, Vocab:Hotels and restaurants, Topic sentences (1), Mixing sentences (1), Mixing sentences (2), Past or Present?, Write two reviews, Quick quiz: a short report Lab work:Write any one review	1
11.	**Software: PracticalWriting.**	**Emails I: Asking for Information (I):** What will I learn?, Emails: an overview, Emails: structure,Finding functional language, Asking people to do things, Enquiries and Responses	1
12.	**Software: PracticalWriting**	**Emails II: Asking for Information (II):** Functional language for emails, Emails: Correcting mistakes, Write two emails, Vocab Focus, Quick quiz:Email basics, Lab work: Write 2 emails	1
13.	**Software: PracticalWriting**	**Official Letters:** What will I learn in this unit? Official letters: layout Official letters: vocabulary Build up an official letter Letters: style. The cover letter: job applications Letters: proofreading Present perfect or simple past? Quick quiz: letters	1
14.	**Software : Practical Writing**	**Text speak:** What will I learn? Text speak: an overviewText terms (1) Text terms (2) Inviting people to do thingsResponding appropriately Text speak and speaking Quick quiz: text speak	1

Total	14

- **Highlighted portions added**

Methodology

The course follows a lab based teaching-learning method with classroom discussions and activities on fundamental concepts of grammar with a strong emphasis on skill development of students with regard to speaking, writing, logically interpreting ideas into words and reasoning in the classroom. The exercises are solved by the students on the software and the marking is automatically shown. Additionally, they are asked to draft letters and memos in their Lab files/registers after reading specimens on the software and improve their English with choice of specific and technical words.

Evaluation

Sr. No.	Components	Total Marks
1	Lab Assignment	10
2	P1	20
3	P2	20
4	Tutorial Activities	50
	Total	100

Attainment of POs through Cos

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	Average
CO1	x	x	x	x	x	x	2	1	2	3	x	3	**0.92**
CO2	x	x	x	x	x	1	3	2	3	3	x	3	**1.25**
CO3	x	x	x	x	x	x	2	3	2	3	x	3	**1.08**
CO4	x	x	x	x	x	1	2	1	2	3	x	3	**1.00**
CO5	x	x	x	x	x	1	2	1	2	3	x	3	**1.00**
Average	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.60**	**2.20**	**1.60**	**2.20**	**3.00**	**0.00**	**3.00**	

INTERNATIONAL HUMAN RESOURCE MANAGEMENT

COURSE CODE: 22B1WHS832

COURSE CREDITS: 3

CORE/ELECTIVE: ELECTIVE

L-T-P: 3-0-0

Pre-requisite: None

Course Objectives:

1. Students gain insight into and appreciation for the complexities and differences of operating a business in an international context as it applies to HRM.
2. Understand human resource management systems and their main challenges in multinational companies and improve their performance accordingly,
3. Efficiently implement specific IHRM activities in multinational companies,
4. Make better strategic decisions about people in international settings
5. Design effective IHRM systems and practices for MNCs.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	Define, explain and compare perspectives and theories related to IHRM	Familiarity
CO-2	Make use of an in-depth understanding of research in IHRM to critically analyse theories, perspectives, and practical problems facing contemporary firms	Assessment
CO-3	Systematically illustrate, define, categorise, and analyse a broad range of issues and problems facing MNCs in their IHRM activities	Assessment
CO-4	Use concepts and tools for explaining and developing theories and methods which can be integrated into practical applications of IHRM	Usage
CO-5	Present, both in speech and writing, the impact of IHRM in MNCs and Discuss, critically reflect upon and evaluate ethical matters related to IHRM	Usage

Course Contents:

Chapter	Topic	Course	Hours

1	Introduction Case : NCR in Scotland	Defining International HRM Variables that moderate differences between domestic and international HRM Applying a strategic view of IHRM	2
2	Internationalization ofHRM :Socio-Cultural Contexts Case: Oki UK ltd	National Culture and HRM HRM and its broad context National Culture and Specific HRM Issues Business imperatives and Other non – cultural influences on HRM	3
3	National Context of HRM:case of 7 major economies Case :Litton imports cellmanufacturing from Sweden	Major economies and their HRM practices HRM in Japan , United States, United Kingdom, Turkey, Arab Middle East, India, China	3
4	**Strategic IHRM** Case : Orgaon laboratories ltd, scotland	• **Introduction to Strategic Management & Industry Analysis** • **Internal Analysis: Resource-Based Strategy** • **Competitive Strategies** • **Corporate Strategies & Globalization** • **Corporate Sustainability**	**3**
5	Staffing International operations for sustainedglobal growth	Approaches to staffing Transferring staff for international business activities The roles of an expatriate The role of the corporate HR function in MNEs	3
6	Recruiting and selecting staff for international assignments	Issues in staff selection ,Factors moderating performance, Selection Criteria, Dual career couples, Are female expatriates different?	3
7	International training anddevelopment Case : Seiko Instruments Case : Transfer of Knowledge in Oki-Trainingand development	The role of expatriate training Components of effective pre-departure training programmes The effectiveness of pre-departure training Developing staff through international assignments	5
8	International compensatio n Case : News Internationalplc	Objectives of international compensation Key components of an international compensation program	3
9	Re-entry and careerissues	The repatriation process, Individual reactions to re-entry , Multinational responses Designing a repatriation programme	3

10	IHRM in the host countrycontext	Standardization and localization of HRM practices Factors driving standardization and Localization Code of conduct-monitoring HRM practicesin the host country	4
11	International industrialrelations Case : Element is and Michelin	Key issues in international relations Trade unions and international industrial relations	4
12	Performance Managemen t Case : Tubular IndustriesScotland Ltd.	Multinational performance management Performance management of international employees	3
13	IHRM trends: complexity,challenges and choices in the future	Research issues and theoretical developments	3
		Total Hours	42

Methodology

The course follows a teaching-learning method with classroom discussions and activities on fundamental concepts of IHRM The format will emphasize capstone lectures, class discussion ofassigned readings and other topics, in-class exercises, case analysis, and a group project.

Suggested Text Book(s):

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

1.	Peter J. Dowling, Marion Festing & Allen D. Engle, SR.: International Human Resource Management (fifth Edition)
2.	D. Briscoe, R. Schuler, & I. Tarique (2012). **International Human Resource Management (4th Edition).** London/New York: Routledge.
3.	Jackson, T.: **International dimensions of human resource management.** London, 2002.
4.	Dessler, G.: **Human Resource Management**. 9th ed., New York, 2003.
5.	Harzing, A. W. & Ruysseveldt, J. (2004). **International human resource management (2th Ed.).** Sage Publication: London.

6.	Briscoe, D. R., Claus , L. M., Schuler , R. S. (2009). **International human resource management: Policies and practices for multinational enterprises.** Routledge

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3	T-3	35	2 Hours	Entire Syllabus
4	Teaching Assessment	25	Entire	5 marks attendance
			Semester	08 – case study
				12- Group Project and Presentation

Attainment of POs through COs												
Sr No	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	0.0	0.0	1.0	0.0	3.0	2.0	3.0	3.0	3.0	3.0	0.0	3.0
CO-2	0.0	0.0	1.0	0.0	3.0	2.0	3.0	3.0	3.0	3.0	0.0	3.0
CO-3	0.0	3.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0	3.0
CO-4	0.0	3.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	2.0	3.0
CO-5	0.0	3.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	0.0	3.0
Average Score	**0.00**	**1.80**	**2.20**	**1.80**	**3.00**	**2.00**	**3.00**	**3.00**	**3.00**	**3.00**	**0.80**	**3.00**

INTERCULTURAL COMMUNICATION

COURSE CODE: 22B1WHS831
COURSE CREDITS: 3
CORE/ELECTIVE: ELECTIVE
L-T-P: 3-0-0

Pre-requisite: None

Course Objectives:

1. Honour and share their own culture while developing a capacity to be inclusive of many other cultures.
2. View cultural differences objectively and understand that differences are not hierarchical.
3. Identify and appreciate the beliefs, values and norms of their own culture and recognize and articulate differences and similarities in dominant cultural patterns.
4. Demonstrate increasing ability to communicate with non-native speakers as well as persons who exhibit a different world view, value system and communicative style.
5. Understand why communicative misunderstanding occurs and how to overcome it.

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	Understand and appreciate cultural differences	Familiarity
CO-2	Access your understanding of cultural differences in various situations	Assessment
CO-3	Assess your ability to overcome the cultural stereotypes and interact effectively	Assessment
CO-4	Develop effective communication skills	Usage
CO-5	Demonstrate the ability to overcome cultural shock and display acceptance	Usage

Course Contents:

Chapter	Topics	Hours
1	Intercultural communication • Intercultural communication • The dominant culture • Co-cultures • Ethics in intercultural communication	4
2	Culture and communication • The uses of communication • Characteristics of communication • Culture • Elements of culture • Characteristics of culture	4

3	Cultural Shock • Cultural Shock • Assimilation • Ethnocentrism and Stereotypes • Intercultural Conflict	8
4	Cultural Values, Identity • Understanding perception • Understanding Values • Cultural Patterns • The Role of Identity • Racism • Ethnocentrism	7
5	Social Media, Cultural and Communication • Cross-cultural Communication on social media • Digital Culture and Social Media • Perspective of Cultural Psychology	3
6	Verbal Message: language • Functions of Language • Language and Meaning • Language and Culture • Interpretation and Translation	8
7	Nonverbal Communication • Functions of Nonverbal Communication • Defining Nonverbal Communication • Nonverbal Communication and Culture • Classification of Nonverbal Communication • Improving Nonverbal Communication Skills	6
8	Culture, Communication and Conflict Resolution • Intercultural conflict • Assessing the Context • Negotiation and Conflict resolution	8
	Total Hours	48

Teaching Methodology

The course will be delivered with the help of lectures, interactive sessions, extemporize, presentations, cases and introspection.

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered up to T-1
2	T-2	25	1.5 Hours	Syllabus covered up to T-2
3	T-3	35	2 Hours	Entire Syllabus

4	Teaching Assessment	25	Entire Semester	Class room participation and performance (20) Attendance (5)

Text Book

1. Samovar, L. A., Porter, R. E., Mc. Daniel & Roy C.S. (2013) *Communication Between Cultures8th Ed*. Wadsworth Cengage Learning.
2. Tannen, D. (1992). *That's Not What I Meant*. Virago Press.

Suggested Readings

1. Samovar, L. A., Porter, R. E. & Mc. Daniel (2012) *Intercultural Communication: A Reader13th Ed*. Wadsworth Cengage Learning.
2. Samovar, L. A. (1998) *Oral Communication: Speaking across Cultures A Reader10th Ed*. McGrawHill.
3. Cameron, D. (2007) *The Myth of Mars and Venus* Oxford University Press.
4. Beamer L. & Varner, I. (2011) *Intercultural Communication in the Global 4th Ed. Workplace* Tata McGraw Hill.

Attainment of POs through COs												
Sr No	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	0	2	3	3	1	3	2	3	3	3	0	3
CO-2	0	2	3	2	1	3	2	3	3	3	0	3
CO-3	0	2	3	2	1	3	2	3	3	3	0	3
CO-4	0	2	3	3	1	3	2	3	3	3	0	3
CO-5	0	2	3	2	1	3	2	3	3	3	0	3
Average Score	0	2	3	2	1	3	2	3	3	3	0	3

Microbial Genetics and Physiology Credits 3	**Course objective** The objectives of this course are to take students through genetics and physiology covering prokaryotic/phage genetics to yeast and higher eukaryotic/ archea domains. Students will be exposed to concepts of complex traits encompassing, genetics and microbial metabolic regulation.	**Students Learning Outcomes** On successful completion of this course, student will be able to: ▪ Describe fundamental molecular principles of genetics. ▪ Describe the basics of genetic mapping. ▪ Understand the principles microbial genetic regulation. ▪ Various tools of the culturing and growth measurement of microorganisms. ▪ Acquaint with mechanisms of survival of various microorganisms.

Unit I Genetics of bacteria, bacteriophages, and Yeast 10 lectures	Concept of a gene in pre-DNA era; mapping of genes in bacterial and phage chromosomes by classical genetic crosses; fine structure analysis of a gene; genetic complementation and other genetic crosses using phenotypic markers; Yeast mating type switch; dominant and recessive genes/mutations, complementation groups
Unit II **Mutants and Mutation** 7 lectures	Mutator genes, screening of mutations based on phenotypes and mapping the same, Loss of function mutants: null, leaky, and conditional mutations. Gain of function mutants, Are mutations random events or adaptive? Mutation rates, probability, and target theory, Uses of mutants
Unit III **Genetic Exchange and restrictions** 5 lectures	Mechanisms of genetic exchange: Genotype vs phenotype, Genetic exchange in nature, Genetic exchange in the lab, Barriers to genetic exchange: host restriction and modification, Plasmids, Properties of some bacterial plasmids, Plasmid replication, Phage, General properties of phages, Lytic growth, Host specificity, Lysogenic phage, Phage Lambda

Unit IV Microbial growth and metabolic regulations 10 lectures	Introduction, thermodynamics principles/ Eh-pH diagrams, Mitchell hypothesis and energetic, The Monod and Pirt models for microbial growth, Chemostats as an indispensible tool for physiological studies, Diversity of metabolism and selective enrichments, Mixed Cultures in the chemostat/selection, Metabolic genetic regulation, Regulatory systems during aerobic- anaerobic shifts
Unit V Growth and cell physiology of extremophilic microorganisms Lectures 10	Growth curve and diauxic growth curve and calculation of generation time and classification of microorganisms based upon nutrient and water activity. Determination of cell count by various methods. Cellular physiology of extremophilic microorganisms. Extremophilic physiological adaptations Methanotrophs, Thermophiles, Acidophiles , Sulfur reduction and SRBs, Mechanisms of survivals of various extremophiles

Recommended Textbooks and References:

1. Hartl, D. L., & Jones, E. W. Genetics: Principles and Analysis. Sudbury, MA: Jones and Bartlett.

2. Pierce, B. A. Genetics: a Conceptual Approach. New York: W.H. Freeman.

3. Tamarin, R. H., & Leavitt, R. W. Principles of Genetics. Dubuque, IA: Wm. C. Brown.

4. Smith, J. M. Evolutionary Genetics. Oxford: Oxford University Press.

5. Klug, W.S., Cummings, R., Spencer, C. A., & Michael A. P., Concepts of Genetics. Pearson Publications

6. Albert G. M., & John W. F., Microbial Physiology, Wiley-Liss, A John Wiley& Sons, Inc. Publications.

7. Trudy T. A, Endang P. et al, Microbial Physiology and Genetics. Intelliz Press,

8. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
Brock Biology of Microorganisms, Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley, David Stahl, W. Matthew Sattley

9. Prescott's Microbiology, By Joanne Willey and Kathleen Sandman and Dorothy Wood

Environmental Studies

COURSE CODE - 18B11GE411

COURSE CREDITS: 0

CORE/ELECTIVE: Audit

L-T-P: 2-0-0

Course Objectives:

1. Identify environmental problems arising due to engineering and technological activities and the science behind those problems.
2. Estimate the population- economic growth, energy requirement and demand.
3. Analyze material balance for different environmental systems
4. Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
5. Identify the major pollutants and abatement devices for environmental management and sustainable development.
6. Recognizing the major concepts of environmental studies, developing problem solving ability, forecasting the global climate change.

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	Introducing basic concept of environmental studies, interdisciplinary nature and scope of the subject.	Familiarity
CO-2	Understanding ecosystem services and its functioning as well as equitable use of natural resources.	Assessment
CO-3	Understanding Pollution, A threat to the environment and finding its solutions, Pollutant sampling and monitoring of samples.	Assessment
CO-4	Correlating the concept of Biodiversity and its importance to human mankind.	Usage
CO-5	Understanding social issues and their impact on environment	Usage
CO-6	Role of Information Technology in environment and human health.	Usage

Course Contents:

Unit	Contents	Lectures required
1	**Multidisciplinary nature of environmental studies:** The Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness, Types of Ecosystems, World Biomes, Ecosystem functioning, Biogeochemical cycles.	**3**
2	**Natural resources, their consumption & Protection:** Natural resources, their consumption & Protection: Water, Land Energy (Renewable, non-renewable, wind, solar, hydro, Biomass), Mineral, Forest, & Food resources, Role of an individual in conservation of natural resources, Equitable use of resources.	**4**
3	**Pollution- a threat to environment:** Pollution- a threat to environment: Air, Water & Land pollution, sources & causes, Space pollution, causes & effects, toxicity limits of pollutants. Critical issues concerning global Environment (Urbanization, population growth, global warming, climate change, acid rain, ozone depletion etc.) and the Roots in: Cultural, Social, Political, Commercial, industrial, territorial domains	**4**
4	**Environmental standards & Quality:** Environmental standards & Quality: Air, Water & Soil Quality, Pollutant sampling, pollution control systems. Green Chemistry and its Application.	**3**
5	**Biodiversity and its conservation:** Biodiversity loss: Diversity of flora and fauna, species and wild life diversity, Biodiversity hotspots, threats to biodiversity.	**4**
6	**Social Issues and the Environment:** Waste land reclamation, consumerism and waste products, eco-consumerism, dematerialization, green technologies, eco-tourism. Water conservation, rain water harvesting, watershed management. Environment protection act, Air (prevention and control of population) act; Water (prevention and control of pollution) act, Wildlife protection act, Forest conservation act, Issues involved in enforcement of environmental legislation National Environmental Policy; Function of pollution control boards (SPCB and CPCB), their roles and responsibilities.	**4**
7	**Human Population and the environment:** Population growth, variation among nations. Population explosion—Family welfare program. Environment and human health. Human rights. Value education. HIV/AIDS. Women and child welfare. Role of	**4**

	Information technology in environment and human health. Case Studies.	
8	**Field work:** Field Work: Explore the surrounding flora & fauna (Study of common plants, insects, birds document environmental assets), documentation of industries in local region and their possible effects, measure of water, air and land quality, Visit to a local polluted site-urban/rural /industrial / agricultural, Study of simple ecosystems-pond, river, hill slopes etc.	**4**
Total lectures		**30**

Suggested Text Book(s):

1. Environmental Studies By: M. P. Poonia and S.C. Sharma, Khanna Publishers
2. Textbook of Environmental Studies for UG Courses –ErachBharucha, University Press
3. Joseph, B., 2005, Environmental Studies, Tata McGraw Hill, India.

Suggested Reference Book(s):

1. Nebel, B.J. & Wright, R.T., 1993, Environmental Science, 8th Edition, Prentice Hall, USA.

2. Chiras D D. (Ed.). 2001. Environmental Science – Creating a sustainable future. 6th ed. Jones & Barlett Publishers.

3. David Laurance. 2003. Environment Impact assessment, Wiley publications.

4. Chhokar KB, Pandya M & Raghunathan M. 2004. Understanding Environment. Sage publications, NewDelhi.

Other useful resource(s):

1. Issues of the journal: Down to Earth, published by Centre for Science and Environment.
2. Audio visuals from: Discovery, National Geographic etc.
3. Rachel Carson 1960. Silent springs

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	Quiz-1	15	1 Hour.	Syllabus covered up to T-1
2	Quiz-2	25	1.5 Hours	Syllabus covered up to T-2
3.	Quiz-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignments- 10 Presentation -10 Attendance-5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

CourseOutcomes	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	2	2 2	2 2	2 2	2 2 1	1	1	2 1	2 2	2 2	2 2	**1. 2 8**	**1.8**
CO-2	2	3	3	3	3	1	1	1	2	2	1	2	**2.0**
CO-3	2	2	2	2	3	1	1	1	2	2	1	2	**1.8**
CO-4	2	3	3	3	2	1	1	1	2	3	2	2	**2.1**
CO-5	2	3	3	2	2	1	1	1	1	1	3	2	**1.8**
CO-6	2	2	2	2	1	1	1	2	2	2	2	2	1.8
Average	**2.0**	**2.5**	**2.5**	**2.33**	**2.16**	**1.0**	**1.0**	**1.16**	**1.8**	**2.0**	**1.8**	**2.0**	

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

(Established by H.P. State Legislature vide Act No. 14 of 2002)

Engineering Physics-I

COURSE CODE: 18B11PH111

COURSE CREDITS: 4

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Pre-requisite: None

Course Objectives:

I. To enable the students to get better understanding about electromagnetics and its applications in engineering.
II. To enable the students to get better understanding about physical optics and its applications in engineering.
III. At the conclusion of the course, the ability of students should have enhanced to think logically about the problems of science and technology and obtain their solutions.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	Students will get better understanding about electromagnetics and its applications in engineering.	Familiarity and Assessment
CO-2	Students will get better understanding about physical optics and its applications in engineering.	Familiarity and Assessment
CO-3	Students will be able to enhance logical thinking about the problems of science and technology	Assessment and Implementation
CO-4	Students will be able to apply learned concepts to obtain solutions to the problems	Assessment and Implementation

Course Contents:

Unit	Contents	Lectures required
1	**Basics of Electromagnetics:** Vector algebra, Electromagnetic Operations (Curl, Divergence, etc), Basics of EM theory, Maxwells equations. EM waves in different mediums	**16**

	(Conducting, Non Conducting). Concept of Poynting Vector and Theorem. Boundary conditions for EM transmissions. Applications of EM theory	
2	**EM to Optics:** Bridge from EM to Wave Optics	**2**
3	**Interference:** Superposition of Waves, Coherence, Concept and phenomenon of Interference with Real and Virtual Sources. Michelson Morley and Fabry–Pérot interferometer and their applications	**12**
4	**Diffraction:** Fraunhofer diffraction by single, double and N slits, Resolving and dispersive power of Diffraction elements. Application of Diffraction (WDM and other applications).	**6**
5	**Polarization:** Introduction, Difference between unpolarized and polarized light, Means of production of polarized light, Optical activity, specific rotation, Lorentz half shade and biquartz polarimeter. Application of Polarizations (Communication and other applications)	**6**
	Total Lectures	**42**

Suggested Text Book(s):

1. D. J. Griffiths, Introduction to Electrodynamics, 4th ed. Eastern Economy Editions: PHI, 2012.
2. S. Sharma & J. Sharma, Engineering Physics, Pearson Pub, 2018.
3. N. Subrahmanyam and N. Subrahmanyam, A Textbook of Optics by, 23rd ed. S. Chand, 2006.
4. R. Fitzpatrick. (2007). Electromagnetism and Optics (An Introductory Course) [Electronic]. https://farside.ph.utexas.edu/teaching/302l/302l.html.

Suggested Reference Book(s):

1. F.A. Jenkins and H.E. White, Fundamentals of Optics, McGraw-Hill:Addison-Wesley Press, 1981.
2. A. Ghatak, Optics, 5th ed. Tata McGraw Hill, 2012.
3. F.A. Jenkins and H.E. White, Fundamentals of Optics, McGraw-Hill, 1981.
4. V. V. Mitin, D. I. Sementsov, An Introduction to Applied Electromagnetics and Optics, CRC Press:Taylor and Francis Group, 2017.

Other useful resource(s):

1. Link to topics related to course:
   i. https://nptel.ac.in/courses/122107035/

ii. https://nptel.ac.in/courses/122103011/
iii. https://nptel.ac.in/courses/122101002/28
iv. https://nptel.ac.in/courses/122105023/

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes (2) - 10 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course outcomes (Engineering Physics-I)													A
CO-1	2	2				2				2		2	**1.25**
CO-2	2	2	2	2	2	2				2		2	**2**
CO-3	3	2				2				2		2	**1.4**
CO-4	3	3				2				2		2	**1.5**
CO-5	3	3	3	3	3	3				3		3	**3**
Average	**2.6**	**2.4**	**2.5**	**2.5**	**2.5**	**2.2**				**2.2**		**2.2**	

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

(Established by H.P. State Legislature vide Act No. 14 of 2002)

Engineering Physics-II

Course code: 18B11PH211
Course credits: 3
Core/Elective: Core
L-T-P: 3-0-0
Pre-requisite: None

Course Objectives:

I. To offer a broad aspect of those areas of Physics which are specifically required as an essential background to engineering students for their studies in higher semesters.
II. To enable the students in gaining problem solving capability
III. To enable the students in acquiring better understanding about quantum science and application for future technology
IV. To familiarize students with quantum information technology
V. To make the students knowledgeable about the thermodynamics and statistics
VI. In conclusion, the ability of students should have enhanced to think logically about the problems of science and technology

Course Outcomes:

S.No.	Course Outcomes	Level of Attachment
CO-1	To learn fundamentals of quantum applications, quantum information theory	Familiarity
CO-2	Knowledge of physical interpretation, and ability to apply ideas to solve problems in science	Familiarity/Problems solving
CO-3	Learning about thermodynamical problems and associated applications for future technology	Familiarity/Problem solving
CO-4	To understand basics of statistical distribution and use of Maxwell's distribution, Bose-Einstein distribution, and Fermi-Dirac distribution	Familiarity/Analytical skills/Problems solving
CO-5	To develop ideas about problems associated to quantum information	Familiarity/Knowledge

Course Contents:

Unit	Contents	Lecture required
1	Quantum nature of light:Photoelectric effect and Compton effect	**4**
2	Stability of atoms and Bohr's rules	**2**
3	Wave particle duality: de Broglie wavelength, phase and group velocity, Uncertainty principle, Double slit experiment	**4**
4	Schrodinger's equation,Physical interpretations of wave functions, elementary idea of operators, Eigenvalue problems	**4**
5	Solution of Schrodinger equations, simple boundary value problems, Harmonic Oscillator, Hydrogen atoms problems	**4**
6	Basics of quantum information: Hilbert's space, Dirac notation, Introduction to qubits, Quantum states, density operators, generalized measurements, quantum operations/channels, no-cloning theorem	**6**
7	Laws of thermodynamics, introduction to entropy, isothermal and adiabatic process, Reversible and irreversible processes. Carnot cycle andCarnot engine, Refrigerator, Clausius-Cleyperon equation	**10**
8	Introduction to macrostate, microstate, Classical and quantum statistics, Density of states M-B, B-E, and F-D statistical distribution, their applications	**8**
Total lectures		**42**

Suggested Text Book(s):

1. R. Eisberg and R. Resnick, Quantum Physics, 2nd ed. John Wiley, 2002.
2. J.J. Sakurai, Jim Napolitano, Modern quantum mechanics, 2nd ed. Addison Wesley:Pearson, 2011.
3. Mark M. Wilde, Quantum information Theory, Cambridge University Press, 2012.
4. B. Lal, N. Subrahmanyam and P.S. Hemne, Heat Thermodynamics and Statistical Physics, 3rd ed. S. Chand, 2012.
5. J. S. Faulkner, Modern Quantum Mechanics and Quantum Information, Department of Physics, Florida Atlantic University, Boca Raton, Florida, FL, USA: IOP Publishing Ltd, 2021.

Suggested Reference Book(s):

1. R. A. Silvio, Salinass, Introduction to Statistical Physics, Springer Verlag, 2004.
2. M. A. Nielsen & I.Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 2000.
3. R. C. Lakhanpal, Modern Approach to Statistical Physics and Thermodynamics, Modern Publishers, 2003.
4. D. J. Griffiths, Introduction to Quantum Mechanics, Reed College: Prentice Hall, 1994.

5. A. N. Michael, and I. L. Chuang, Quantum Computation and Quantum Information, 10th ed. Cambridge university press, 2010.

Other useful resource(s):

1. https://www.qi.damtp.cam.ac.uk/part-iii-quantum-information-theory
2. https://www.youtube.com/watch?v=bE5flUzaU1w
3. https://www.youtube.com/watch?v=EuYBGnsCj14

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (3) -15 Quizzes(2) -5 Attendance - 5

Course Outcomes (COs) contribution to the ProgrammeOutcomes(POs)

Course outcomes (Engineering Physics - II)													Average
CO-1	3	3	3	2	2	1	1	-	-	-	-	2	**2.125**
CO-2	2	3	3	3	3	1	1	-	-	-	-	3	**2.375**
CO-3	3	2	2	2	2	1	1	-	-	-	-	2	**1.875**
CO-4	3	2	2	2	2	3	3	-	-	-	-	2	**1.875**
CO-5	2	3	3	3	3	1	1	-	-	-	-	3	**2.375**
Average	**2.6**	**2.6**	**2.6**	**2.4**	**2.4**	**1.4**	**1.4**	**-**	**-**	**-**	**-**	**2.4**	

Basic Engineering Physics - I

COURSE CODE: xxB11PH112

COURSE CREDITS: 4

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Pre-requisite: None

Course Objectives:

1. To understand the general scientific concepts required for technology.
2. To apply the concepts in solving BT/BI engineering problems.
3. To explain scientifically the new developments in engineering and technology
4. To get familiarized with the concepts, theories, and models behind many technological applications.

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	Understand the basic concepts of nature light and matter.	Familiarity
CO-2	Apply the concept of light in physical optics, lasers and Optical fibers.	Assessment and usage
CO-3	Acquire the fundamental knowledge of surface tension and plasma physics	Assessment and usage
CO-4	Familiarized with the basic concepts of biomaterials	Familiarity and assessment
CO-5	Familiarized with the basic concepts of nanotechnology	Familiarity

Course Contents:

Unit	Contents	Lectures required
1	**Wave Optics: Interference, Diffraction and Polarization:** Wave nature of light, Particle nature of radiation, the wave nature of matter, Wave function, X-rays, Bragg's law. Interference by division of wave front, Interference by division of amplitude. Fraunhofer diffraction: Single slit, circular aperture, double slit, N-slit, resolving power and dispersive power of diffraction grating. Brewster's law, Malu's law, elliptically and circularly polarized light, optical activity, specific rotation.	16
2	**Lasers, Optical fibers and Plasma Physics:** Principle and working of laser, Different types of lasers (Three level and four level lasers). Optical Fibers: principle, types, material, mode, refractive index; Fibre loss, Expression for acceptance angle and numerical aperture. Application-Communication. Plasma Physics: Plasma state, types of plasma, applications of plasma.	10
3	**Biomaterials:** Introduction to Biomaterials: Biomaterial, Types of Biomaterials, Biocompatible, Biodegradable, Bio-resorbable Bio-inert Bio-active Biological materials, Pyrogenicity, Properties of Biomaterials, Interaction of biomaterials with bio-molecules, Performance and applications of Biomaterials.	8
4	**Introduction to Nanotechnology:** Origin of Nanotechnology, Nano Scale, Quantum Confinement, and Fabrication: Bottom-up and Top-down, Characterization, introduction to nano-biotechnology. Introduction to Active Colloids and Molecular motor proteins: functions, interaction and applications.	8
Total lectures		**42**

Suggested Text Book(s):

1. B. L. And N. Subramanyam, Optics, S. Chand & Company, 2012.
2. S. Sharma & J. Sharma, Engineering Physics, Pearson Pub, 2018.
3. N. Mehta, Applied Physics for Engineers, PHI India Limited, 2011.
4. K. K. Chattopadhyay, Introduction to Nanoscience and Nanotechnology, PHI India, 2009.
5. J.B. Part, Biomaterials Science and Engineering, Plenum Press, 1984.
6. J.Y. Wong and V. D. Bronzino (Eds), Biomaterials, CRC Press: Taylor and Francis, 2006.
7. Pignatello R. (Editor), Biomaterials Science and Engineering, InTech Publishing, 2011.
8. E. A. Ludwig , Biomaterial Science: Anatomy and Physiology Aspects, Walter de Gruyter GmbH & Co KG, 2022.

Suggested Reference Book(s):

1. A. Ghatak, Optics, Tata McGraw Hill, 2005.

2. A. Beiser, Concepts of Modern Physics, McGraw Hill, 1994.
3. B.B. Ratner, A.S. Hoffman, F. J. Schoen, J. E. Lemnos, Biomaterials Science: An Introduction to Materials in Medicine, Elsevier Academic Press, 2004.
4. R. Lakes, and J. D. Bronzino, *The Biomedical Engineering Handbook,* 2nd ed. Boca Raton: CRC Press LLC, 2000.
5. J. Park and R. S. Lakes, Biomaterials: An introduction, Springer, 2007.

Other useful resource(s):

1. https://nptel.ac.in/courses/122107035/
2. https://nptel.ac.in/courses/122103011/
3. https://nptel.ac.in/courses/122103010/
4. https://nptel.ac.in/courses/118107015/
5. https://nptel.ac.in/courses/118102003/
6. https://nptel.ac.in/courses/122101002/27

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (3) -15 Quizzes (2) - 5 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course outcomes (Basic Engineering Physics - I)													**Average**
CO-1	3	3	3	2	2	1	1	-	-	-	-	2	**2.125**
CO-2	2	3	3	3	3	1	1	-	-	-	-	3	**2.375**
CO-3	3	2	2	2	2	1	1	-	-	-	-	2	**1.875**
CO-4	3	2	2	2	2	3	3	-	-	-	-	2	**1.875**
CO-5	2	3	3	3	3	1	1	-	-	-	-	3	**2.375**
Average	**2.6**	**2.6**	**2.6**	**2.4**	**2.4**	**1.4**	**1.4**	**-**	**-**	**-**	**-**	**2.4**	

Bioinstrumentation Techniques

COURSE CODE: xxB1WPH212

COURSE CREDITS: 4

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Pre-requisite: None

Course Objectives:

I. To learn concepts for strong foundation of biophysical methods and their application in the field of biotechnology.

II. Exposure to various instruments used in Biophysics.

III. To be able to use important biophysical methods to decipher problems relevant to biology.

IV. Understanding of the underlying theory of these methods and their practical applications in the laboratories.

V. Better understanding of the structure-function activity of biomolecules.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	Basic concepts of spectroscopy, X-Ray Diffraction	Familiarity, assessment and usage
CO-2	Electron Microscopy, Electronic spectroscopy	Familiarity, assessment and usage
CO-3	Infrared spectroscopy, Raman Spectroscopy	Familiarity, assessment and usage
CO-4	Mass Spectroscopy and spin resonance spectroscopy	Familiarity, assessment and usage
CO-5	Particle analysis and Chromatography	Familiarity, assessment and usage

Course Contents:

https://www.spectroscopyonline.com/view/bioanalysis-instruments-0

Unit	Contents	Lectures Required
1	**Electron microscopy:** Optical to electron microscopy, Transmission electron microscope, Scanning electron Microscopy, Protein crystallography	**6**
2	**Electronic spectroscopy:** UV-VIS spectroscopy and Circular dichorism spectroscopy, Fluorescence Spectroscopy	**8**
3	**Infrared Spectroscopy and Raman Spectroscopy:** Fourier Transform Infrared Spectroscopy, Raman spectroscopy, Molecular polarisability, Applications in the field of biotechnology.	**8**
4	**Mass Spectroscopy and spin resonance spectroscopy:** Producing the ion, Detection of ions and Identifying of compounds. Analysis and applications. Interaction between spin and magnetic field, Nuclear Magnetic Resonance, NMR Applications in Biochemistry, Biophysics and Medicines.	**8**
5	**Imaging Techniques:** Fluorescence Microscopy, Fluorescence-activated Cell Sorting (FACS), Fluorescence In Situ Hybridization (FISH), X-rays, computed tomography (CT) scans, and magnetic resonance imaging (MRI) scans, X-rays, Atomic force microscopy **Particle Analysis:** Dynamic light scattering for size determination and zeta potential for surface charge determination: Concept and analysis	**12**
Total Lectures		**42**

Suggested Text Book(s):

1. C. N. Banwell, Fundamentals of Molecular Spectroscopy. McGraw-Hill, 1994.
2. S.Svanberg, Atomic and Molecular Spectroscopy: Basic Aspects and Practical applications, Springer Science & Business Media, 2012.
3. G. Aruldhas, Molecular structure and spectroscopy, PHI Learning Pvt. Ltd., 2007.
4. J.Y. Wong and V. D. Bronzino (Eds), Biomaterials, CRC Press: Taylor and Francis, 2006.
5. H. S. Barbara, Infrared Spectroscopy: Fundamentals and Applications, Wiley, 2004.
6. S. O. Pillai, Solid State Physics, 7th ed. New age international publishers, 2016.

7. J. R. Lakowicz, Principles of Fluorescence Spectroscopy, Springer Science & Business Media, 2013.

Suggested Reference Book(s):

1. B. C. Smith, Fundamentals of Fourier Transform Infrared Spectroscopy, 2nd ed., CRC Press, 2011.
2. S. S. Mohapatra, S. Ranjan, N. Dasgupta, R. K. Mishra, S.Thomas, Characterization and Biology of Nanomaterials for Drug Delivery , Elsevier, 2019.
3. R. Tantra Editor(s):, Nanomaterial Characterization: An Introduction, (2016), John Wiley & Sons, Inc., 2016.

Other useful resource(s):

1. NPTEL course contents
2. Relevant research articles

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3	T-3	35	2 Hours	Entire Syllabus
4	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes (2) - 10 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes(POs)

Course outcomes (Bioinstrumentation Techniques)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	3	2	3	1	1	1	1	1	1	1	3	**1.75**
CO-2	3	3	3	3	2	1	1	1	2	1	1	3	**2.00**
CO-3	3	3	3	3	3	1	1	2	2	1	1	3	**2.16**
CO-4	3	3	3	3	3	2	2	2	2	1	2	3	**2.42**
CO-5	3	3	3	3	2	2	1	1	1	1	1	1	**1.83**
Average	**3.00**	**3.00**	**2.80**	**3.00**	**2.20**	**1.40**	**1.20**	**1.40**	**1.60**	**1.00**	**1.20**	**2.60**	

Science and Technology of Materials

COURSE CODE: 18B1WPH531

COURSE CREDITS: 3

CORE/ELECTIVE: ELECTIVE (ECE)

L-T-P: 3-1-0

Pre-requisite: None

Course Objectives:

I. To enable the students to get better understanding about materials, properties and their applications in engineering
II. To familiarize students for making proper selection of materials for different applications.
III. To enable the students to use the knowledge about materials for their projects and ultimately apply the materials knowledge in their respective professional career.
IV. At the conclusion of the course, the student should have a far greater capacity to read and understand technical articles such as those seen in the IEEE Transactions on Electron Devices, IEEE Transactions on Nanotechnology, Computer-aided design, Computational Materials Science *etc*.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	To learn the fundamentals and Science of Materials.	Familiarity
CO-2	To implement the concepts and theories for analyzing the behaviour of the materials.	Familiarity
CO-3	To execute the concepts and theories in solving the problems related to material properties and their applications.	Analytical & Computational skills
CO-4	To introduce innovations in areas like Semiconducting Materials, Optoelectronic Materials and Engineering Materials Science, etc.	Innovative Skills
CO-5	To analyze various materials for scientific and technical applications	Technical skills

Course Contents:

Unit	Contents	Lectures required
1	Introduction to Dielectric materials, Capacitance, Polarization, Types of Polarization, Polarization mechanism & Dielectric Constant, Frequency Dependence of the Dielectric Constant, Ferro electricity, Piezoelectricity and pyro electricity, Applications of Dielectric Materials.	**10**
2	Introduction to Optoelectronic materials, Applications of Optical Phenomena Luminescence, Materials of Importance—Light-Emitting Diode Materials, photoconductivity	**6**
3	Semiconducting materials: Semiconductor basics, intrinsic and extrinsic semiconductors-n & p-type, Fermi level, carrier concentration, mobility, conductivity, p-n junctions-band diagram, forward and reverse I-V characteristics, C-V, Ideality factor, p-n-p and n-p-n transistor-basic concepts, Doping in solids	**6**
4	Introduction to Magnetic materials, Concept of magnetism, Classification, dia-, para-, ferro-, antiferro- and ferri-magnetic materials, Influence of Temperature on Magnetic Behavior; Domains and Hysteresis; Magnetic Anisotropy Applications in storage devices.	**8**
5	Introduction to Composite materials-Polymers & Ceramics, Various types of Polymers and their applications, Structure, Types, Properties and Applications of Ceramics, Electrical Conduction in Ceramics and Polymers. Applications.	**6**
6	New Engineering Materials: Metallic Glasses, Shape Memory Alloys, Memory Effect, Smart materials, Nano-materials- significance of nanoscale, 0, 1, 2 and 3- Dimensional nanostructures, Applications.	**6**
Total lectures		**42**

Suggested Text Book(s):

1. S. O. Pillai, Solid State Physics, 7th ed. New age international publishers, , 2016.
2. M.A. Wahab, Solid State Physics: Structure and Properties of Materials, 3rd ed. Narosa, , 2015.
3. S.M. Sze, Physics of Semiconductor Devices, 3rd ed. Wiley, 2008.
4. W. D. Callister, D. G. Rethwisch, Materials Science And Engineering: An Introduction , 10th ed. Hoboken, Nj : Wiley, 2018.

Suggested Reference Book(s):

1. C. Kittel, Introduction to Solid State Physics, 8th ed. John Wiley & Sons, 2005.
2. S. Sharma and J. Sharma, Engineering Physics, Pearson India, 2018.

Other useful resource(s):

1. http://www.advancedsciencenews.com/best-of-advanced-optical-materials/
2. https://onlinecourses.nptel.ac.in/noc19_ph04/preview

EvaluationScheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes(2) -10 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes(POs)

Course outcomes (Science and Technology of Materials)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	3										3	3
CO-2	3											3	3
CO-3	1	1	1									1	1
CO-4	2	2	2	2								2	2
CO-5	3	3	3	3					3			3	3
Average Score	2.4	2.25	2	2.5					3			2.4	2.425

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

(Established by H.P. State Legislature vide Act No. 14 of 2002)

Applied Materials Science

COURSE CODE: 18B1WPH532

COURSE CREDITS: 3

CORE/ELECTIVE: ELECTIVE (CSE, IT)

L-T-P: 3-0-0

Pre-requisite: None

Course Objectives:

I. To enable the students to get better understanding about materials, properties and their applications in engineering
II. To familiarize students for making proper selection of materials for different applications.
III. To enable the students to use the knowledge about materials for their projects and ultimately apply the materials knowledge in their respective professional career.
IV. At the conclusion of the course, the student should have a far greater capacity to read and understand technical articles such as those seen in the IEEE Transactions on Electron Devices, IEEE Transactions on Nanotechnology, Computer-aided design, Computational Materials Science *etc*.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	To learn the fundamentals and Science of Materials.	Familiarity
CO-2	To implement the concepts and theories for analyzing the behaviour of the materials.	Familiarity
CO-3	To execute the concepts and theories in solving the problems related to material properties and their applications.	Analytical & Computational skills
CO-4	To introduce innovations in areas like Display Technology , Thermoelectrics and Engineering Materials Science, etc.	Innovative Skills
CO-5	To analyze various materials for scientific and technical applications	Technical skills

Course Contents:

Unit	Contents	Lectures required
1	Dielectrics: Polarization mechanism & Dielectric Constant, Behavior of polarization under impulse and frequency switching, Dielectric loss, Spontaneous polarization, Piezoelectric and Pyroelectric materials, Applications of Dielectric Materials.	9
2	Polymers: Various types of Polymers and their applications; Mechanical behaviour of Polymers, synthesis of polymers. Conducting polymers	3
3	Ceramics: Structure, Types, Properties and Applications of Ceramics; Mechanical 18behaviour and Processing of Ceramics	2
4	Magnetism: Concept of magnetism, Classification, dia-, para-, ferro-, antiferro- and ferri-magnetic materials, Their properties and Applications; Hysteresis; Magnetic Storage devices.	7
5	Superconductivity: Meissner effect, Critical field, type-I and type-II superconductors; Field penetration and London equation; High temperature Superconductors, Flux quantization, Josephson junction and their Applications.	5
6	Introduction to Thermoelectric materials, Figure of merit, Heat Capacity, Conductivity (electronic and thermal), Applications in sensors, energy harvesting etc.	6
7	Display Devices: Fluorescent Materials, LED, LCD.	3
8	New Engineering Materials: Metallic Glasses, Shape Memory Alloys, Memory Effect, Smart materials, Nano-materials- significance of Nanoscale, 0-Dimensional, 1- Dimensional, 2- Dimensional, 3- Dimensional nanostructures, Applications.	5
9	Computational Materials Science: Atomistic theory of matter – from electrons to interaction potentials, Electronic structure theory, computational toolbox, determination of band structure using codes	2
Total lectures		**42**

Suggested Text Book(s):

1. S. O. Pillai, Solid State Physics, 7th ed. New age international publishers, , 2016.
2. M.A. Wahab, Solid State Physics: Structure and Properties of Materials, 3rd ed. Narosa, 2015.
3. R. M. Martin, Electronic Structure: Basic Theory and Practical Methods, 1st ed. Cambridge University Press, 2008.
4. W. D. Callister, D.G. Rethwisch, Materials Science and Engineering: An Introduction, 10th ed. Hoboken, Nj : Wiley, 2018.

Suggested Reference Book(s):

1. C. Kittel, Introduction to Solid State Physics, 8th ed. John Wiley & Sons, 2005.
2. G. S. Nolas , J. Sharp , H. J. Goldsmid, Thermoelectrics: Basic Principles and New Materials Developments, Springer Berlin: Heidelberg, 2010.
3. S. Sharma and J. Sharma, Engineering Physics, Pearson India, 2018.

Other useful resource(s):

1. http://www.advancedsciencenews.com/best-of-advanced-optical-materials/
2. https://onlinecourses.nptel.ac.in/noc19_ph04/preview

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes(2) -10 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course outcomes (Applied Materials Science)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	3										3	3
CO-2	3											3	3
CO-3	1	1	1									1	1
CO-4	2	2	2	2								2	2
CO-5	3	3	3	3					3			3	3
Average Score	2.4	2.25	2	2.5					3			2.4	2.425

Building Materials and Construction

COURSECODE:18B11CE313

COURSE CREDITS: 3

CORE/ELECTIVE: CORE

L-T-P: 3-0-0

Pre-requisite: None

Course Objectives:

1. To gain understanding of properties and usage of bricks, stones, timber and miscellaneous materials used in construction.
2. To become familiar with classification of buildings, walls, brick masonry and stonemasonry
3. To be well versed with the properties and usage of plastering, roofs, floors, doors, damp proofing, stairsetc.
4. To gain state of the art knowledge of properties and usage of scaffolding, sound and fire proofing, paints and distempers.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	Learn about properties and usage of bricks, stones, timber and miscellaneous materials used in construction.	Familiarity
CO-2	Learn about classification of buildings, walls, brick masonryand stone masonry	Familiarity
CO-3	Learn the properties and usage of plastering, roofs, floors, doors, damp proofing, stairs etc.	Familiarity
CO-4	Learn the properties and usage of scaffolding, sound and fire proofing, paints and distempers.	Familiarity

Course Contents:

Unit	Contents	Lectures required
1	**Bricks:** Classification, properties and selection criteria ofbricks, burning of bricks, tests for bricks.	2
2	**Stones:** Stone classification, characteristics of good building stone, common building stones in India, Limestone.	1
3	**Timber:** Characteristics of good timber, defects in timber, seasoning of timber, plywood.	2
4	**Miscellaneous Materials:** Classification of Engineering Materials, Mechanical properties of Materials, (Added)Cement, Concrete, steel, glass, plastics, P.V.C., paint, varnish, adhesive materials, bitumen, ceramics, Geosynthetic material.	7
5	**Buildings and Walls**: Classification of buildings, types of walls	1
6	**Brick Masonry**: Technical terms, types of bonds, strength of brick masonry, defects in brick masonry, reinforced brickwork	2
7	**Stone Masonry**: Technical terms, stones, cutting and dressing, lifting of stones, joints in stone masonry, classification of stone masonry, selection of stone for masonry	1
8	**Plastering and Pointing**: Objects and requirements of plastering, terminologies, tools, methods of plastering, selection of good plaster, types of mortars, plaster finishes, defects, Pointing: Methods and types ofpointing	4
9	**Roofs and Floors**: Types and construction of roofs, features, necessity, arches, lintels, types & construction of ground floor, upper floor, floor finishes	3
10	**Doors and Windows**: Location, Technical terms of door & window, door frame, size, designation of door and window, types of door & window	2
11	**Damp Proofing and Termite Proofing**: Causes, effects, various methods and material used for damp proofing and termite proofing	3
12	**Stairs**: Technical terms, requirements, dimension of step, types and classification of stairs	3
13	**Paints, Distemper, White wash and Color wash**: Paints and Paintings, characteristics of ideal paint, Constituents of paint, defects in paintings, painting on different surfaces,(Removed) classification and type of paints, Distempering & process of distempering, white washing & color washing	4
14	**Scaffolding**: Components and types of scaffolding	2
15	**Sound and Fire proof construction**: Sound Insulation, Insulation values for different type of walls, sound proof materials, Fire: Causes, fire hazards, fire load, grading of building according to fire resistance,,(Removed) characteristics of fire resisting materials, fire alarms, fire extinguishing equipments. Concept of Sustainable Materials; Material Selection for sustainable design, Green buildings rating	5

	Systems(Added)	
Total lectures		**42**

Suggested Text Book(s):

1. S.K Duggal: Building Materials, 4th Edition, New Age InternationalPublishers,2012.
2. B.C Punmia, Ashok Kr. Jain, Arun Kr. Jain: Building Construction,11th Edition, Lakshmi Publications,2016.
3. M.L Gambhir, Neha Jamwal, Building Materials, Mc Graw Hill,2014

Suggested Reference Book(s):

1. Rangwala, Building Construction, 33rd Edition, Charotar Publishing House Pvt.Ltd.,
2. M.K Gupta, Practical Handbook on Building Construction, Nabhi ,2014.

Other useful resource(s):

1. Link to MIT Open Courseware :https://ocw.mit.edu/courses/architecture/4-461-building-technology-i-materials-and-construction-fall-2004/lecture-notes
2. Link to NPTELcourse:https://nptel.ac.in/syllabus/syllabus.php?subjectId=105102088

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes(2) -10 Attendance - 5

Course Outcomes (COs) contribution to the ProgrammeOutcomes(POs)

Course Outcomes (Building Materials and Construction)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	2	2	3	2	2	3	3	1	2	2	2	2	**2.17**
CO-2	3	1	3	3	3	1	3	3	3	3	2	3	**2.58**
CO-3	2	2	3	1	3	2	2	2	2	2	1	2	**2**
CO-4	3	3	3	3	2	3	1	2	3	1	3	3	**2.5**
Average	**2.5**	**2**	**3**	**2.25**	**2.5**	**2.25**	**2.25**	**2**	**2.25**	**2**	**2**	**2.25**	

Fluid Mechanics

COURSE CODE: 18B11CE412
COURSE CREDITS: 3
CORE/ELECTIVE: CORE
L-T-P:3-0-0

Pre-requisite: None

Course Objectives:

1. To get familiar with knowledge of fundamental of fluid and fluid flowcharacteristics.
2. To understand various methods to determine pressure measurement velocity measurement offluid.
3. To understand various Principles of pipe flow losses occurred on pipe flow and its applications in reallife.
4. To impart the knowledge of Dimensional analysis for solving the problems of fluid mechanics
5. To get familiar with the concept of flow phenomenon around the immersed bodies

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	Knowledge of basic fundamentals of fluid and fluid flow characteristics.	Familiarity
CO-2	The students will understand basic methods to determine pressure measurement of fluid	Assessment
CO-3	Understanding of kinematics of fluid flow	Assessment
CO-4	Understanding of principles of pipe flow and basic fluid flow measurement instruments and techniques.	Assessment
CO-5	They will develop understanding of methods of dimensional analysis & modeling criteria.	Assessment
CO-6	Understanding the flow phenomenon around the immersed bodies	Assessment

Course Contents:

Unit	Contents	Lectures required
1	**Properties of fluid:** mass density, specific weight, specific volume, specific gravity; Viscosity, Newton's Law of viscosity, Types of Fluids, Surface tension and Capillarity.	3
2	**Pressure and its Measurement**: Pascal's Law, Pressure variation in a fluid at rest, Measurement of pressure: Manometers	4
3	**Hydrostatic forces on surfaces**: Total pressure and centre of pressure, Pressure measurement on Vertical plane surface, horizontal plane surface, curved surface and Inclinedsurface	3
4	**Buoyancy and Flotation:** Buoyancy, Metacentre, Metacentric height, Experimental method of determination of metacentric height	2
5	**Kinematics of fluid flow: S**teady& unsteady, uniform & non-uniform, rotational & irrotational, laminar & turbulent flow, Continuity equations for 1-D & 2-D flows, velocity and acceleration, velocity potential function, stream function, types of motion,vorticity.	5
6	**Dynamics of fluid flow**: Euler's equation, Bernoulli's equation & its applications, Impulse-momentum equation & its applications, Flow measurements: Venturimeter, Pitot-tube, Orifice-meter	6
7	**Dimensional analysis:** methods of analysis, Rayleigh's method, pie-Buckingham theorem, Dimensionless numbers.	3
8	**Boundary Layer Theory:** Concept of boundary layer, laminar and turbulent boundary layers, boundary layer thickness, Von Karman integral equation, laminar sublayer	4
9	**Forces on submerged bodies:** drag and lift force, Expression for grag and lift, Drag on a sphere, Drag on a cylinder, Karman vortex trail	4
10	**Flow through pipes:** Losses in pipe sections, hydraulic gradient line and total energy line, flow through pipes in series and parallel, compound pipes, HeigenPousille's equation, Darcy-Weisbach'sequation, branching of pipes and pipe networks.	8
Total lectures		**42**

Suggested Text Book(s):

1. Modi and Seth: Fluid mechanics and hydraulic machines, 3rd Edition, Prentice-Hall of India, 2010.
2. R K Bansal: A text Book of Fluid mechanics, - Laxmi Publication,2010
3. DSKumar: FluidmechanicsandFluidpowerEngineering,6thEdition S. K. Kataria& Sons, 2002

Suggested Reference Book(s):

1. Douglas, John F., Gasiorek, Janusz M., Swaffield, John A. 4TH Edition, Pearson Education Asia,2006
2. R J Garde, Fluid Mechanics Through Problems 3rd Edition,New Age International Publishers 2016

Other useful resource(s):

1. Link to NPTEL coursecontents:https://nptel.ac.in/courses/105101082/

2. Link to topics related tocourse:
   - **i.** https://nptel.ac.in/courses/105101082/**3**
   - ii. https://nptel.ac.in/courses/105101082/4
   - iii. https://nptel.ac.in/courses/105101082/6 -16

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (5) - 10 Quizzes (2) -10 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course Outcomes (Fluid Mechanics)	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**Average**
CO-1	3	3	3	2	2	3	x	x	1	1	1	3	**2**
CO-2	3	3	3	2	2	3	x	x	2	1	2	3	**2.4**
CO-3	3	3	3	3	2	2	x	x	2	2	1	3	**2.4**
CO-4	3	3	3	3	3	2	x	x	2	3	2	3	**2.7**
CO-5	3	3	3	3	3	2	x	x	1	2	2	3	**2.5**
CO-6	3	3	3	3	2	3	x	x	2	2	2	3	**2.6**
Average	**3**	**3**	**3**	**2.67**	**2.33**	**2.5**	**0**	**0**	**1.67**	**1.8**	**1.67**	**3**	

Surveying

COURSE CODE: 18B11CE312

COURSE CREDITS: 3

CORE/ELECTIVE: CORE

L-T-P: 3-0-0

Pre-requisite: None

Course Objectives:

Surveying is of special importance and interest to a Civil Engineer. Surveying is a general term that covers any survey work carried out in connection with the construction of an engineering project, such as buildings, dam, highways, railways, bridges, canals, water supply, drainage works and other civil engineering works. The main objectives are:

1. To produce up-to-date *Engineering Plans* of the areas in which the work will be carried out.
2. To determine the corrections in different measurements
3. To ensure that the construction takes place in the correct relative and absolute position on theground.
4. Knowledge of advanced surveying methods; Remote Sensing and GIS

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	Understanding of basic principles of various methods of surveying, and related problems.	Assessment
CO-2	Will be able to apply various corrections in different measurements.	Assessment
CO-3	Will be able to get the correct relative and absolute position on the ground where construction is required.	Assessment
CO-4	Knowledge of modern survey equipment, Implement procedures for its use and care of field equipment.	Assessment
CO-5	Understanding of the design of curves.	Assessment
CO-6	Understanding of advanced surveying methods; Remote Sensing and GIS	Familiarity

Course Contents:

Unit	Contents	Lectures required
1	**Introduction:** History of surveying and mapping, importance of geomatics engineering, plane and geodetic surveying, concept of datum and map projection system,Classification of Surveying, Principles of Surveying.	2
2	**Chain Surveying:** Instruments for chaining, Errors due to incorrect chain, Chaining on sloping ground, Errors in chaining, Tape corrections, Chain triangulation, setting out right angles, basic problems in chaining, conventional symbols used in chaining	2
3	**Compass surveying:** Instruments (prismatic and surveyor compass), bearing and angles, magnetic declination, local attractions.	3
4	**Leveling:** Instruments, Optical defects in lenses, Temporary adjustment of a level, and different types of leveling, curvature and refraction corrections, leveling problems, errors in leveling, the level tube.	5
5	**Contouring:** Contours, contour interval, contour gradient, characteristics of contours, methods of locating contours and their interpretation, uses of contour maps.	4
6	**Plane Table Surveying:** Instruments, principle and methods of plane- tabling, three-point problem, two-point problem, errors in plane tabling, advantages and disadvantages.	3
7	**Tacheometric and Theodolite:** Surveying: transit and non-transit, definition and terms, measurement of horizontal and vertical angles, instruments and tachometric method	4
8	**Modern Field Survey Systems:** Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Global Positioning, Systems- Segments, GPS measurements,	4
9	**Curves:** Elements of simple and compound curves – Method of setting out of simple circular curve – Elements of Reverse curve - Transition curve – length of curve – Elements of transitioncurve.	5
10	**Remote Sensing and GIS:** Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital imageprocessing, Introduction to GIS, types of data, components of GIS.GIS architecture, vector data models, raster data models	7
12	**Photographic Surveying:** Principles, Types of photographs, Concept of Relief Displacement, advantages of aerial photography	3
Total lectures		**42**

Suggested Text Book(s):

1. S K Duggal: Surveying, 3rd Edition, Tata McGraw-Hill Publishing Company ,2012
2. A.M.Chandra: Plane Surveying,2nd Edition, New Age International Publishers, New Delhi,2006
3. B.C.Punmia: Surveying-1, Surveying-2, Laxmi Publication Delhi,2005
4. N.N.Basak: Surveying &Leveling Tata McGraw Hill Publishing Com. NewDelhi

Reference Books:

1. B.C.Punmia: Surveying-3, Laxmi Publication Delhi, 2005

Suggested Reference Book(s):

1. Kavanagh, Barry F.: Surveying : Principles and applications, 7th Edition, Pearson EducationAsia,2006
2. A.M.Chandra: Higher Surveying 2nd Edition, New Age International Publishers New Delhi,2006
3. Clark David: Plane and Geodetic surveying for Engineers, vol-1 & vol-2,6th Edition, CBS Publishers, 2006

Other useful resource(s):

1. Link to NPTEL coursecontents: https://nptel.ac.in/courses/105107122/
2. Link to topics relatedtocourse:
   i. https://nptel.ac.in/courses/105107122/1-3
   ii. https://nptel.ac.in/courses/105107122/8-18
   iii. https://nptel.ac.in/courses/105107122/23-32

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (5) - 10 Quizzes (2)-10 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course Outcomes (Surveying)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	2	2	1	2	2	2	3	2	3	2	3	**2.25**
CO-2	3	2	2	2	2	2	2	1	2	2	3	3	**2.16**
CO-3	3	3	3	3	2	1	2	2	2	2	3	3	**2.41**
CO-4	2	3	2	3	3	1	1	2	1	1	2	3	**2**
CO-5	3	2	3	3	3	2	1	2	3	3	2	3	**2.5**
CO-6	3	3	3	3	2	1	1	2	1	1	3	3	**2.16**
Average	**2.83**	**2.5**	**2.5**	**2.5**	**2.33**	**1.5**	**1.5**	**2**	**1.83**	**2**	**2.5**	**3**	

Water Resource Engineering

COURSE CODE: 18B11CE414
COURSE CREDITS: 3
CORE/ELECTIVE: CORE
L-T-P: 3-0-0

Pre-requisite: Fluid Mechanics, Soil Mechanics

Course Objectives:

1. To impart the knowledge of hydrology that deals with the occurrence, distribution, movement and properties of water on the earth and beneath the surface as groundwater.
2. To supplement the knowledge of various irrigation techniques, water requirements of the crops and the estimation of the water supplies.
3. To learn about distribution systems for canal irrigation, design of unlined and lined irrigation canals design with their economic justification and sediment problems associated with canals.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	Knowledge of various components of hydrologic cycle that affect the movement of water in the earth and their estimation techniques.	Familiarity and Assessment
CO-2	Ability to estimate stream flow through various stream flow measurements techniques.	Assessment
CO-3	Grasping of the concepts of movement of ground water beneath the earth and ability to estimate the yielding capacity of the source.	Familiarity and Assessment
CO-4	Knowledge of the basic requirements of irrigation and various irrigation techniques and estimation of water to be supplied for crop requirements.	Familiarity and Usage
CO-5	Understanding of distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals.	Familiarity and Usage

Lecture plan

S No.	Topic	No. of lectures
1	**Hydrology:** Hydrological cycle, precipitation and its measurement, DAD curve, mean rainfall over a drainage basin, snowfall and snowmelt, ~~ground and surface water resource, single and multipurpose projects~~	4
2	Evaporation, transpiration, depression storage, infiltration, overland flow, Φ index , w-index, infiltration capacity, measurement of infiltration rate	4
3	**Stream flow measurements**: direct measurements, measurement of stage, wire gauge , automatic stage recorder-float gauge recorder, bubble gauge recorder; current meter, area velocity method, moving boat method, , dilution technique, indirect methods-slope area method	4
4	Hydrograph, its application, factor affecting flood hydrograph, base flow separation methods, stream flow hydrograph, direct runoff hydrograph, unit hydrograph, S-Curve technique	5
5	Flood estimation , Rational methods, Empirical formulae, Envelope curve, flood frequency analysis-probability method, Gumbel's method, confidence limits	3
6	**Ground water flow** : Aquifer characteristics-Specific yield, storage coefficient, coefficient of permeability, confined and unconfined aquifers, aquitards, aquifuge	2
7	Flow through wells: Radial flow into a well under confined and unconfined conditions, tube wells, pumping and recuperation tests, ground water potential.	4
8	**Irrigation Engineering**: Water requirements of crops, Moisture-crop relationship, Irrigation requirements, duty and delta, Irrigation efficiencies, Design of conventional and modern methods of irrigation, ~~Irrigation of arid lands~~	6
9	Salinity of soil, Salinity control, Quality of irrigation water, Contaminants and their effects on various crop types, Rain water management, conjunctive use of water, Water logging causes and control, drainage system design.	3
10	**Canals :** Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributory canals, ~~drainage system~~	2
11	Alluvial and Non alluvial canals, design of alluvial channels, Kennedy's theory, lacey's theory, regime channels, design of non- alluvial channels, design of lined canals, most efficient section, ~~critical shear stress, bed load, local and suspended load transport, cost analysis of lined and unlined canals, drainage behind lining.~~	5
	Total	**42**

Text Books:

1. Garg, S. K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers,1997.
2. Todd, D. K., Ground water Hydrology, John willey & sons, Newyork, 1995
3. Subramanya, K., Engineering Hydrology, McGraw Hill Education

Reference books:

1. Applied Hydrology -Ven T Chow, David R Maidment, Larry W Mays
2. Bharat Singh, Fundamentals of Irrigation Engineering, Nem Chand and Brothers.

TEACHING METHODOLOGY: The course will be covered through lectures supported by presentations and video demonstrations.

EVALUATION SCHEME:

Instrument	**Duration**	**Marks**
Mid term1	1	15
Mid Term2	1.5 hour	25
End term	2 hour	35
Internal Assessment*		25
Total		100

*** Internal Assessment is based on Assignments, Tutorials, Quizzes, and Regularity in Attendance**

	Total Nos.	Max. marks
Assignment		10
Attendance		5
Class Quiz 1	5(marks)	10
Class Quiz 2	5 (marks)	
	Total	25

Correlation of COs with POs

Course Out-comes	Programme Outcomes												Average
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	
CO1	3	2	1	3	2	2	3	2	3	2	2	2	**2.3**
CO2	3	3	2	1	3	2	3	2	3	2	1	2	**2.3**
CO3	3	2	2	1	3	2	2	3	2	2	1	2	**2.1**
CO4	3	3	3	1	3	1	3	2	3	3	2	2	**2.4**
CO5	3	3	2	2	3	2	2	2	3	2	2	2	**2.3**
Average	**3**	**2.6**	**2**	**1.6**	**2.8**	**1.8**	**2.6**	**2.2**	**2.8**	**2.2**	**1.6**	**2**	

Design of Steel Structures

COURSE CODE: 18 B11CE612

COURSE CREDITS: 3

CORE/ELECTIVE: CORE

L-T-P: 3-0-0

Pre-requisite: Mechanics of Solids

Course Objectives:

1. Learn to analyze algorithms for Time and SpaceComplexity
2. To provide a basic understanding of the mechanical properties and types of steels used in civil structures, and to develop technical competence in the design of tension and compression members, beams, and simple bolted and welded connections.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	Design bolt and weld connections.	Familiarity
CO-2	Design tension and compression members.	Assessment
CO-3	Design beams and beam columns.	Assessment
CO-4	Design built up members and column base.	Usage
CO-5	Design of Plate Girder ad steel truss.	Usage

Course Contents:

Unit	Contents	Lectures required
1	**Introduction:** General- Types of Steel – Mechanical behavior of steel – Measures of Yielding – Measures of Ductility – Types of Structures – Structural Steel Sections**.**	**2**

2	**Methods of Structural design**: Introduction-Design Philosophies-Working Stress method-Ultimate Strength method-Load and Resistant factor- Limit State Method-Partial safety factor-Load-Load combinations-Classification of Cross sections- General aspects in the design.	**2**
3	**Design of Steel fasteners:** Types of fasteners – Riveted connections-Bolted connections- Assumptions- Failure of bolted joints – Strength of bolted joints – Design examples – Design of Welded connections – Butt weld- fillet weld – Design examples. **Design of Eccentric Connections**: Design of Brackets- Type-1 and Type 2 – Moment Resistant connections - Design Examples	**8**
4	**Design of Tension Members:** General – Modes of Failure of Tension member- Analysis of Tension members- Example - Design steps – Design examples – Lug angles – Design.	**6**
5	**Design of Compression Members:** Modes of Failure of a Column, Buckling Failure: Euler's Theory, Effective Length, Slenderness Ratio, Design Formula: I.S. Code Formula, Design of Compression Members, Design of Built-Up Compression Members: Laced and Battened Columns	**6**
6	**Design of Beams:** General- Lateral Stability of Beams- Bending Strength of Beams – Plastic Section Modulus - Design Examples	**4**
7	**Design of Beam Columns:** Behavior of members under combined loading – Modes of Failures – Design Examples.	**4**
8	**Design of Column Splices and Column Base:** Design of Column Splice-Design Examples, Slab Base- Gusseted Base- Design Examples	**4**
9	**Design of Plate Girder:** General- Components of Plate Girder-Optimum depth – Bending Strength – Shear Strength – Shear Buckling-Simple Post critical method- Tension Field method- Stiffeners-Bearing-Transverse stiffeners - Design Examples.	**4**
10	**Design of steel truss:** General -components of steel truss, design of purlins, moment resisting frames.(added)	**2**
Total lectures		**42**

Suggested Text Book(s):

1. Design of steel structures – N Subramanian, Oxford University Press – 2009.
2. Limit State Design of steel structures, S.K. Duggal, Tata McGraw- Hill, 2010.
3. IS - 800:2007.
4. IS – 808:1989.

Suggested Reference Book(s):

1. Design of Steel structures by K.S. Sai Ram, Person Education.

2. Design of Steel Structures Edwin H. Gaylord, Jr. Charles N. Gaylord and James Stallmeyer Tata McGraw-Hill Education Pvt. Ltd.
3. Design of Steel Structures Vol. 1 & 2 – Ramchandra, Standard Publications.
4. Design of steel structures, Structures, S.S. Bhavikatti, IK int Publication House, New Delhi, 2010.

Other useful resource(s):

1. Link to NPTEL course contents:https://nptel.ac.in/courses/105106112/

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (10) - 10 Quizzes(2) -10 Attendance - 5

Course Outcomes (COs) contribution to the ProgrammeOutcomes(POs)

Course Outcomes (Design of Steel Structures)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	2	2	2	2	2	1	1	1	2	2	2	2	**1.75**
CO-2	2	3	3	3	3	1	1	1	2	2	1	2	**2**
CO-3	2	2	2	2	3	1	1	1	2	2	1	2	**1.75**
CO-4	2	3	3	3	2	1	1	1	2	3	2	2	**2**
CO-5	3	2	3	3	2	3	2	1	2	2	3	3	**2.4**
Average	**2.2**	**2.4**	**2.6**	**2.6**	**2.4**	**1.4**	**1.2**	**1**	**2**	**2.2**	**1.8**	**2.2**	

Soft Computing & Optimization Algorithms

COURSE CODE: 21B1WMA831

COURSE CREDITS: 3

CORE/ELECTIVE: ELECTIVE

L-T-P: 3-0-0

Course Objectives: On successful completion of this course a student will be able

1. To describe various types of soft computing techniques, and applications of soft computing.
2. To describe the fuzzy sets and fuzzy logic
3. To describe the fuzzy controller and fuzzy rule base and approximate reasoning.
4. To describe the evolutionary computing.
5. To understand the concepts of genetic algorithm.

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	Understand the basic tools of soft computing.	Familiarity
CO-2	Understand the fuzzy sets and crisp sets, fuzzy set theory and operations.	Assessment
CO-3	Understand the fuzzy controller and fuzzy rule base and approximate reasoning.	Assessment
CO-4	Understand the basic evolutionary processes.	Familiarity
CO-5	Understand the working principle and procedures of genetic algorithm.	Usage

Course Contents:

Unit	Contents	Lectures required
1	**Introduction:** Introduction, soft computing vs. hard computing, various types of soft computing techniques, and applications of soft computing. Basic tools of soft computing - Fuzzy logic, neural network, evolutionary computing. Introduction: Neural networks, application scope of neural networks, fuzzy logic, genetic algorithm, and hybrid systems.	**08**
2	**Fuzzy Sets and Logic:** Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion. Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications and Defuzzifications.	**08**
3	**Fuzzy Systems:** Fuzzy Controller, Fuzzy rule base and approximate reasoning: truth values and tables in fuzzy logic, fuzzy propositions formation of rules, decomposition of compound rules, aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference system, fuzzy expert systems.	**10**
4	**Evolutionary Computing:** Basic Evolutionary Processes: A Simple Evolutionary System, Evolutionary Systems as Problem Solvers, A Historical Perspective, Canonical Evolutionary Algorithms - Evolutionary Programming, Evolution Strategies, A Unified View of Simple EAs- A Common Framework, Population Size.	**06**

5	**Genetic Algorithm:** Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, Traditional algorithm vs genetic algorithm, simple GA, general genetic algorithm, schema theorem, Classification of genetic algorithm, Holland classifier systems, genetic programming, applications of genetic algorithm, Convergence of GA. Applications and advances in GA, Differences and similarities between GA and other traditional method, applications.	**10**
Total Lectures		**42**

Suggested Text Book(s):

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, International Editions, Electrical Engineering Series, Singapore, 1997.
3. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.

Suggested Reference Book(s):

1. Stamatios V. Kartalopoulos "Understanding Neural Networks and Fuzzy Logic Basic concepts & Applications", IEEE Press, PHI, New Delhi, 2004
2. Vojislav Kecman, "Learning & Soft Computing Support Vector Machines, Neural Networks, and Fuzzy Logic Models", Pearson Education, New Delhi,2006.
3. S. Rajasekaran & GA Vijayalakshmi Pai "Neural Networks, Fuzzy Logic, and Genetic Algorithms synthesis and application", PH

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered up to T-1
2	T-2	25	1.5 Hours	Syllabus covered up to T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes (2) - 10 Attendance - 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course Outcomes (Soft Computing & Optimization Algorithms)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	2	2	2	3	2	1	1	1	2	2	2	1.9
CO-2	3	2	3	3	3	1	1	1	1	2	2	2	2
CO-3	3	2	3	3	3	2	1	1	1	2	2	2	2.1
CO-4	3	3	3	3	3	2	3	1	1	3	3	3	2.6
CO-5	3	3	3	3	3	3	1	1	1	2	3	3	2.4
Average	3	2.25	2.75	2.75	3	1.75	1.5	1	1	2.25	2.25	2.25	2.2

Biostatistics (Revised)

COURSE CODE: 18B11MA411

COURSE CREDITS: 3

CORE/ELECTIVE: CORE

L-T-P: 3-0-0

Pre-requisite: Basic Mathematics-I and II.

Course Objectives:

1. To study multiple linear regression and correlation model.

2. To study non-parametric tests, stochastic process and clustering along with their application in Bio-informatics.

Course Outcomes:

S. No.	Course Outcomes	Level of Attainment
CO-1	Perform correlation and regression analysis and draw conclusions and apply to bio-informatics models. Use method of least squares for curve fitting.	Familiarity
CO-2	Construct sample spaces of random experiments; Compute probability and apply Baye's theorem to simple situations. Understand random variables and probability distributions.	Familiarity
CO-3	Conduct hypotheses tests concerning population parameters based on sample data; perform and interpret chi-square test of goodness-of-fit and test of independence.	Assessment
CO-4	Execute non parametric tests and run tests and draw conclusions.	Usage
CO-5	Understand stochastic processes and find ensemble averages, WSS and SSS processes. Understand the Markov chains and apply Markov process and Poisson's process.	Usage

Course Contents:

Unit	Contents	lectures required
1	Bivariate data, scatter plots. Karl Pearson's correlation coefficients, Spearman's rank correlation coefficients, properties of correlation coefficient, curve fitting- method of least squares; overview of linear, multiple linear regression, nonlinear regression, logistic regression	**10**
2	**Probability:** Random experiment, sample space, event, types of events. three approaches to probability, additive and multiplicative laws of probability, conditional probability, total probability theorem and bayes' theorem. **Random Variables:** Introduction: probability mass function (PMF), probability density function (PDF) and cumulative distribution function	**12**

	(CDF)., mathematical expectation, moments of random a variable – mean and variance, moment generating function of a random variable. **Probability Distributions:** Binomial, Poisson distribution; uniform, exponential, gamma and normal distributions.	
3	**Parametric Tests:** Introduction to sampling distribution; testing of hypotheses: critical value, critical region, confidence interval, level of significance, p-value; test for one sample proportion & tests for mean and variance for single and double samples: z-test, t-test and F-test; chi-square test of goodness-of-fit and independence of attributes.	**6**
4	**Non-parametric Tests:** Need of non-parametric tests, sign test for one sample and two samples, signed-rank test, Wilcoxon test (Mann-Whitney test), run test for randomness, Kruskal- Wallis and Friedman's test.	**5**
5	**Stochastic Processes:** Introduction and classification of stochastic processes, ensemble averages – mean function, auto-correlation function, auto-covariance function, stationary processes – strict-sense stationary (SSS) process and widesense stationary (WSS) process. M**arkov processes** - Markov chains – Markov property, transition probability matrix, state-diagram, processes with independent increments - Poisson process, modeling (applications of Markov chains in bio-informatics), Brownian motion – simple random walk.	**9**
Total Lectures		**42**

Suggested Text Book(s):

1. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Academic Press, (2009).
2. Ronald E. Walpole , Raymond H. Myers , Sharon L. Myers and Keying E. Ye, ``Probability and statistics for engineers and scientists'', 9th Edition, Pearson, 2011.
3. Jay L. Devore, ``Probability and statistics for engineering and the sciences", Cengage Learning, 8th Edition, 2011.
4. Oliver C. Ibe, ``Fundamentals of applied probability and random processes", Academic press, 2005.
5. T. Veerarajan: ``Probability, statistics and random processes", Tata McGraw-Hill, Third edition, 2008.
6. W. J. Ewens and G. R. Grant: "Statistical methods in bioinformatics", Springer 2001.

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered up to T-1
2	T-2	25	1.5 Hours	Syllabus covered up to T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) – 10 Quizzes (2) - 10 Attendance – 5

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course Outcomes (Biostatistics)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	1	3	3	3	3	3	3	2	2	2	3	**2.58**
CO-2	3	2	1	2	1	3	1	2	1	2	3	3	**2.00**
CO-3	3	2	3	2	2	2	3	3	2	3	3	3	**2.58**
CO-4	3	2	3	2	2	2	3	3	2	3	3	3	**2.58**
CO-5	3	3	3	2	3	3	3	2	3	2	2	3	**2.67**
Average	**3.00**	**2.00**	**2.60**	**2.20**	**2.20**	**2.60**	**2.60**	**2.60**	**2.00**	**2.40**	**2.60**	**3.00**	

Biostatistics Lab (Revised)

COURSE CODE: 18B11MA412

COURSE CREDITS: 1

CORE/ELECTIVE: CORE

L-T-P: 0-0-2

Pre-requisite: Basic Knowledge of Excel and R

Course Objectives: After completion of this course, the students will be able to the following learning:

1. To develop programs for various probability and statistical concepts/procedures **in R**.
2. To execute and perform fundamental and specific statistical tests using R.

S. No.	Course Outcomes	Level of Attainment
CO-1	Getting familiar with R. Learn data input, vector functions, arrays and graphics. Understand to write R Functions and implementation.	Familiarity
CO-2	Understand to write and execute the programs for calculate correlation and regression analysis and curve fitting,	Usage
CO-3	Understand to write and execute the programs for discrete and continuous probability distributions.	Assessment
CO-4	Understand to write and execute the programs for parametric and non-parametric tests.	Assessment
CO-5	Understand to write and execute the programs for Markov and Poisson's processes.	Usage

List of Experiments:

S.No	Description	Hours
1	Getting started with R, simple calculations, generating sequences, vectors, vector functions, matrices and array.	2
2	Loops and repeats, writing R functions, data inputs, graphics.	2
3	Tables, mathematical functions, probability functions.	2
4	To write and execute a program to calculate correlation and simple linear regression coefficients.	2
5	To write and execute a program for multiple linear regression and nonlinear regression.	2
6	To write and execute a program for binomial and Poisson's distributions.	2
7	To write and execute a program for uniform, normal, exponential and gamma distributions	2
8	To write and execute a program for parametric tests (t and F tests)	2

9	To write and execute a program for parametric tests (Chi-square tests)	2
10	To write and execute a program for non-parametric tests (sign test, Wilcoxon test).	2
11	To write and execute a program for non-parametric tests (run test, Kruskal-Wallis test and Friedman's test).	2
12	To write and execute a program to obtain one-step and n-step transition probability distributions for a given homogeneous Markov chain.	2
13	To write and execute a program to obtain steady state probability distribution for a given homogeneous Markov chain with n states.	2
14	To write and execute a program to obtain probability distribution for Poisson process for given arrival rate and time-interval with a specified detecting probability.	2
Total Lab Hours		**28**

Suggested Text Book(s):

1. Crawley M. J., `` The R Book", Wiley, 2nd Edition, Reprint, 2017.
2. Baclawski K., " Introduction to Probability with R", 1st Edition, Reprint, Chapman & Hall/CRC, 2011
3. Kabacoff R. I., " R in Action", Dream Tech Press, 2nd Edition, 2015.
4. Ugarte, M. D., Militino, A. F., & Arnholt, A. T., " Probability and Statistics with R", CRC press, 2008

Evaluation Scheme:

1	Mid Sem. Evaluation	20 Marks
2	End Sem. Evaluation	20 Marks
3	Attendance	15 Marks
4	Lab Assessment	45 Marks
	Total	100 Marks

Course Outcomes (COs) contribution to the Programme Outcomes (POs)

Course Outcomes (Biostatistics Lab)	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	Average
CO-1	3	1	2	3	2	3	3	3	2	3	2	3	**2.50**
CO-2	3	2	1	2	2	2	3	3	2	2	2	3	**2.25**
CO-3	3	2	2	3	2	3	3	3	2	3	3	3	**2.67**
CO-4	3	2	2	3	2	3	3	3	2	3	3	3	**2.67**
CO-5	3	1	3	2	2	3	3	3	2	3	3	3	**2.58**
Average	**3.00**	**1.60**	**2.00**	**2.60**	**2.00**	**2.80**	**3.00**	**3.00**	**2.00**	**2.80**	**2.60**	**3.00**	