PSG Institute of Management
PSG College of Technology

# MBA
## WM & SE

Regulations and Syllabus 2021

(Updated in Feb 2023)

# PSG COLLEGE OF TECHNOLOGY
# COIMBATORE - 641 004

**(Autonomous College affiliated to Anna University, Chennai)**

## MBA - WASTE MANAGEMENT AND SOCIAL ENTREPRENEURSHIP

**DEGREE PROGRAMME**

## 2021 SCHEMA and SYLLABUS

PSG Institute of Management
PSG College of Technology

## VISION

To be a leader amongst the private business schools in India, by proactively engaging with our stakeholders in academics, research and skill development and bench-marking ourselves with the best-in-class standards of business education

## MISSION

- Empower – Empower Individuals to achieve their managerial and entrepreneurial potential.
- Innovate – Develop innovative teaching and learning methodologies.
- Research – Focus on academic and industry based research relevant to the region.
- Nurture – Nurture and enhance the institute's visibility, growth and value by espousing ethics and social responsibility and by collaborating with institutional and professional stakeholder groups.

## PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

MBA – Waste Management and Social Entrepreneurship programme curriculum is designed to prepare the post graduate students

- To progress in one's chosen profession
- To be able to identify and/or create business opportunities.
- To be an asset to the organisation as an effective team player
- To be a socially and ethically responsible individual

## PROGRAMME OUTCOMES (POs)

On successful completion of the programme, students should develop

1. Ability to apply knowledge of management theories and practices to solve business problems
2. Analytical and critical thinking for data-based decision making
3. Value-based Leadership
4. Ability to understand, analyze and communicate economic, legal, and ethical aspects of business
5. Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment
6. Ability to identify opportunities and create entrepreneurial solutions.

# PSG COLLEGE OF TECHNOLOGY, COIMBATORE - 641 004

(Autonomous College affiliated to Anna University, Chennai)

## 2021 REGULATIONS OF MBA DEGREE PROGRAMMES

(for the batches of students admitted in 2021-22 and subsequently under Choice Based Credit System)

**NOTE:** The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time totime. Any or all such amendments will be effective from such date and to such batches of students (including those already in the middle of the programme) as may be decided by the Academic Council.

### 1. a. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In the following Regulations, unless the context otherwise requires

i. "Programme" means Degree Programme, such as MBA, MBA (Waste Management and Social Entrepreneurship) Programme

ii. "Course" means a theory or practical subject that is normally studied in a semester, such as Research Methods, Financial Management and the like.

iii. "University" means Anna University, Chennai.

### b. CONDITIONS FOR ADMISSION

Students for admission to the first semester of the Master of Business Administration (MBA)/ Master of Business Administration (Waste Management and Social Entrepreneurship) (MBA (WM&SE))programme of Anna University, Chennai will be required to satisfy the eligibility qualification for admission in Section 3 or any other examination of any recognized University or authority accepted by Anna University, Chennai as equivalent thereto. The students shall also be required to satisfy all other conditions of admission thereto prescribed by the University and Government of Tamil Nadu.

### 2. DURATION OF THE PROGRAMME

i. **Minimum Duration:** The programme will extend over a period of two academic years, leading to the Degree of Master of Business Administration (MBA), Master of Business Administration (Waste Management and Social Entrepreneurship) (MBA (WM&SE)) in full time mode. An academic year is divided into two semesters.Each semester shall normally consist of 90 working days including examination days.

ii. **Maximum Duration:** The student shall complete the MBA, MBA (WM&SE) full time degree programmes in 2 years (4semesters), but not more than 4 years. These durations are to be reckoned from the commencement of the semester to which the student was first admitted to the programme.

### 3. QUALIFICATIONS FOR ADMISSION

The MBA degree programme offered and the eligible qualifications for admission to the respective programmes are listed below:

| Department | Degree Programme offered | Eligible Qualification for Admission (Note 1) | Minimum Credits |
|---|---|---|---|
| Management Sciences | **MBA** | As per ANNA UNIVERSITY norms | 92 |
| | **MBA (WM&SE)** | | 93 |

**Note 1:** Eligible Qualification is subject to amendments as may be made by the University from time totime.

## 4. STRUCTURE OF PROGRAMMES

**i.** The course work of the odd semesters will normally be conducted only in odd semesters and that of the even semesters only in even semesters.

**ii. Curriculum:** The curriculum for each program will comprise courses of study as given in section 13 infra in accordancewith the prescribed syllabi.

**iii. Core Courses:** Every student shall undergo professional core courses, professional elective courses and employability enhancement courses as given in section 13 infra. Every student shall opt for electives from the list of electives relating to his/her degree programme as given in section 13 in consultation with the Tutor, Programme Coordinator and the HoD. However, a student may be permitted to take a maximum of two professional electives from the list of professional elective courses of the other MBA degree programme with specific permission from the HoD.

**iv. Audit Courses:** Every student shall undergo one audit course relating to his / her degree programme. These are the courses for the purpose of self-enrichment and academic exploration. There is no requirement on minimum number of credits to be earned for this category of courses but a pass is mandatory. The students will be evaluated by a committee of the faculty members of the department and the Pass/Re-appearance (RA) will be transferred to grade sheet. Assessment includes presentations on literature review from reputed journal papers, preparation of review papers, presentation of technical reports and viva voice. However, this assessment is not included in the computation of CGPA.

**v. Online Courses (**SWAYAM based NPTEL, GIAN, NISM, NSE-NCFM, NCCMP,AMFI, IRDA): Students can register and earn credits for online courses approved by department committee consisting of HoD, Programme Coordinator, Tutor and Subject Expert. Students who complete relevant online courses (having 3 credits only) successfully to a maximum of 6 credits may obtain exemption from studying two Professional Electives. The list of online courses is to be approved by the Chairman, Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the subsequent Academic Council meeting. For earning credits through online courses, students will be evaluated within the institute and will be recommended grades based on assessment given in Section 8. Students may do online courses during the third and fourth semester.

**vi. Self-Study Courses:** A student can opt for Self Study of a Professional Elective on specific approval of HoD provided the student does not have current arrears. The students shall study on their own under the guidance of a faculty member approved by the Head of the Department who will be responsible for the periodic monitoring and evaluation of the course. No formal lectures would be delivered. The self-study course can be considered as equivalent to studying one professional elective course

**vii. Internship:** Every student of MBA shall undertake an internship at the end of second semesterin an industry / research organization in consultation with the faculty guide and theHoD and the same shall be jointly supervised by a faculty guide and an expert from the organization. Each candidate is expected to prepare a report about the internship and make a presentation of the same. This will be evaluated by experts from industry and academia. Every student of MBA (WM&SE) shall undertake three internships as mentioned in infra 13 adhering to the norms mentioned above.

**viii. Project:** Every student of MBA shall undertake a suitable project in consultation with the faculty guide and the HoD. The Project is divided in two phases. Project Phase-1 shall be done by the student in the third semester and Project Phase-2 in the fourth semester. The student shall review literature relevant to the specific area of research, frame a set of questions relevant to the project, gather and analyse data appropriate to address those questions, draw conclusions, prepare a detailed report and do an oral presentation of the research findings.

**ix. Course Enrollment and Registration:**

a) Each student, on admission shall be assigned to a Tutor who shall advise and counsel the student about the details of the academic programme and the choice of courses considering the student's academic background and career objectives.

b) Each student on admission shall register for all the courses prescribed in the curriculum in the student's first semester of study.

c) From second semester onwards, a student has the option to drop a maximum of two theory courses except Professional Core Courses in a semester and a student has the option to study two additional theory courses which shall be only Professional Electives. However the maximum number of credits the student can register in a particular semester cannot exceed 30 credits including courses for which the student has registered for redo.

d) In case of a student dropping a course of study (other than professional core courses) in one semester, he/she shall register for that course in the next given opportunity and earn necessary attendance in that course exclusively to become eligible to appear for the semester examination in that course.

e) The courses to be offered in a semester for candidateswho need to reappear (as per 5 (iii) a infra), attendance shortage candidates etc., will be decided by HoD.

f) After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment marks and appear for the End Semester Examinations.

The enrollment for all the courses of the Semester II to IV for all the programs will commence 10 working days prior to the last working day of the preceding semester. The student shall enroll for the courses with the guidance of the Tutor. If the student wishes, the student may drop or add courses subject to eligibility within five working days after the commencement of the concerned semester and complete the registration process duly authorized by the Tutor.

**x. Credit Assignment:** Each course is assigned certain number of credits based on the following:

| Contact Period per week | Credits |
|---|---|
| One Lecture Period | 1 |
| One Tutorial Periods | 1 |
| Two Practical Periods (Laboratory / Seminar / Project Phase-1 and 2 / etc.) | 1 |
| Audit Courses | No Credits |

The Contact Periods per week for Tutorials and Practical sessions can only be in multiples of 2. The number of credits assigned to the different courses is shown in section 13.

**xi. Minimum Credits:** For the award of the degree, the student shall earn a minimum total creditsof 92 for MBA and 93 for MBA (WM&SE) by passing the prescribed courses of study as given in Section 13.

**xii. Medium of Instruction:** The medium of instruction for examinations, project report etc. shall beEnglish only.

## 5. REQUIREMENTS OF ATTENDANCE AND PROGRESS

i) A student will be qualified to appear for end semester examinations in a particular course of a semester only if

a) he/she has satisfied the attendance requirements as per the norms given below:

- Shall secure not less than 75% attendance in that course

- If a student secures attendance 65% or more but less than 75% in any course in the current semester due to medical reasons (hospitalization / accident / specific illness) or due to participation in the College / University / State / National / International level Sports events with prior permission from the Chairman, Sports Board and HoD concerned, the student shall be given exemption from the prescribed attendance requirement and shall be permitted to appear for the end semester examination of that course.

b) his/her academic progress has been satisfactory and

c) his/her conduct has been satisfactory.

ii) A student shall normally be permitted to appear for end semester examination of the course if the student has satisfied the attendance requirements (vide Clause 5 (i) supra) and has registered for examination in those courses of that semester by paying the prescribed fee.

iii) a) Students who do not satisfy clause 5(i) supra will not be permitted to appear for the end semester examination / evaluation of that course/s. They have to register and redo those courses in a subsequent semester when it is offered next, earn necessary attendance and continuous assessment(CA) marks and appear for end semester examinations.

b) If the total number of “Redo” courses at the end of any semester is more than TWO for a student, he/she will not be eligible to register for next immediate odd and further semester courses.

Such students will be permitted to register for those semester courses only when offered next, subject to the condition that the number of “Redo” courses is less than or equal to TWO at the time of registration.

c) If a student with more than TWO “Redo” courses is in the last batch of his/her current regulation then,

i. the courses which he/she has to redo in the next regulation instead of the redo courses in the current regulation

ii. the passed courses in the current regulation which could be / could not be found equivalent to courses in next regulation for the purpose of calculation of CGPA and

iii. the courses inthe next regulation which he/she has to study on own without attendance requirement

shall be identifiedand the student willbe permitted to redo the courses under the new regulation accordingly.

iv) A student who has already appeared for a course in a semester and passed the examination is not entitled to reappear in the same course for improvement of letter grades / marks.

v) In respect of students who complete a part of the academic programme either one or two semesters under the student exchange scheme in approved foreign Universities, the transfer of credits of equivalent courses completed by them in the foreign university will be approved; and in the case of the remaining courses of the respective semester(s) which they have not studied in the respective regulation, they shall register for those courses within the next two or subsequent semesters on a self-study basis. Such an appearance of

the student in those courses will be treated as first appearance for the purpose of classification. (Vide sections infra 10 (A, B, C & D)).

## 6. DISCIPLINE

i) Every student is required to observe discipline and decorous behaviour both inside and outside the college and not to indulge in any activity which will tend to bring down the prestige of the college. The Head of the Institution shall constitute a disciplinary committee to enquire into acts of indiscipline and notify the punishment.

ii) If a student indulges in malpractice in any of the examinations, he/she shall be liable for punitive action as decided by the Board of Examiners

## 7. PROCEDURE FOR REJOINING THE PROGRAMME

A student who desires to re-join the program after a period of discontinuance or who upon his/her own request is permitted by the authorities to repeat the study of any semester, may join the semester which he/she is eligible or permitted to join, only at the time of its normal commencement for a regular batch of students and after obtaining the approval from the University and Commissioner of Technical Education. No student will however be enrolled in more than one semester at any time.

## 8. ASSESSMENT AND PASSING REQUIREMENTS

**i. Assessment:** The assessment will comprise of either Final Examination (FE) for 50 marks and Continuous Assessment (CA) for 50 marks OR Continuous Assessment for 100 marks as specified in the scheme in section 13 infra. For Theory courses, the CA marks will be scaled down from 50 to 40 marks and the Final Examination (FE), which will be conducted for 100 marks, will be scaled down to 60 marks and the total being 100 marks (CA 40 + FE 60). For Laboratory courses including Project work, the Continuous Assessment (CA) marks will be scaled up from 50 to 60 marks and the Final Examination (FE) marks which will be conducted for 50 marks will be scaled down to 40 marks. The award of grades for a course will be done on Relative Grading System or on Absolute Grading System as specified in section 8(vi) (a) supra.

**ii. Semester EndExaminations:** Semester end examinations will normally be conducted during October / Novemberand during March / April of each year. Supplementary examinations may be conducted at such times as may be decided by the college.

A student will be permitted to appear for the Final Examination in a course only if he/she has completed the study of that course.

**iii. Internship:** Every student shall submit a report on internship/s on dates announced by the college / department through the HoD. If a student fails to submit the report on the internship/s, he/she is deemed to have failed in it.

Every student shall make presentation about the internship/s before a review committee constituted by the HoD. The internship/s will be evaluated based on the presentation, reports and viva-voce examination.

The evaluation ofinternship/s will be carried out in the semester indicated in infra 13 and the results of the same will bepublished along with other courses of that semester.

**iv. Project Phase-1 for MBA:** Every student shall submit a report on Project Phase-1 on dates announced by thedepartment through the faculty guide to the HoD. If a student fails to submit the report on Project Phase-1 on or before the specified date, he/she is deemed to have failed in it.

The student shall also present seminars about the progress of the Project Phase-1 during the semester. The seminars shall be presented before a review committee constituted by the HoD.

The Project Phase-1 will be evaluated based on the seminars, report and a viva-voce examination. The viva-voce examination will be carried outby a team consisting of an internal examiner, usually the faculty guide, and an external examiner, appointed by the HoD.
A student who fails in Project Phase-1 shall register for redoing the same at the beginning of the subsequent semester. However, the student will be allowed to enrol for Project Phase-2 along with Project Phase-1 during the beginning of the subsequent semester for satisfactory completion of both the courses.

**v. Project Phase-2 for MBA:** Every student shall submit a report on Project Phase-2 on dates announcedby the HoD. If a student fails to submit the report on Project Phase-2 on or before the specified date, he/she is deemed to have failed in it.

The student shall also present seminars about the progress of the Project Phase-2 during the appropriate semester. The seminars shall be presented before a review committee constituted by the HoD.

The Project Phase-2 will be evaluated based on the seminars, report and a viva-voce examination. The viva-voce examination will be carried out by a team consisting of an internal examiner, usually the faculty guide, and an external examiner, appointed by the HoD. The continuous assessment marks of Project Phase-2 shall not be carried over to the next appearance, if the student has failed in the same.

A student who fails in Project Phase-2 shall register for repeating the same at the beginning of the subsequent semester.

**vi. Grade and Grade Point:** Each student, based on his / her performance, will be awarded afinal grade and grade point as given in the table infra for each course at the end of each semester by following relative grading system and absolute grading system

**a. Relative Grading System**

In this system, the grades are awarded to the students based on their performance relative to others in Theory courses having Continuous Assessment (CA) and Final Examination (FE) components.

For each course, the total mark M ie., the sum of Continuous Assessment marks (CA) and Final examination marks (FE) in the case of theory courses or CA in the case of courses with 100% Continuous Assessment component is computed for every candidate.

The students who secure the total mark M as detailed below are first declared as fail (RA) in a course.

| | |
|---|---|
| Marks scored in FE is less than 50%<br>(or)<br>M less than 50% of total marks | Grade: RA |

**Note:**

- "RA" denotes reappearance in a course

After omitting the marks (M) of all failed students, if the number of students who have passed in a course is more than 30, Relative Grading system shall be followed and if it less than or equal to 30, Absolute Grading System shall be followed. For awarding grades by Relative Grading System, the software developed by Anna University shall be used and it normalizes the result data by using BOX-COX transformation method.

Then letter grade and grade point to each student are awarded as given in the table below.

| Letter Grade | Grade Points, g |
|---|---|
| O (Outstanding) | 10 |
| A + (Excellent) | 9 |
| A (Very Good) | 8 |
| B + (Good) | 7 |
| B (Average) | 6 |
| C (Satisfactory) | 5 |
| RA (Re-appearance) | 0 |
| SA (Shortage of Attendance) | 0 |
| W (Withdrawal) | 0 |

**b. Absolute Grading System**

If the number of students registered for a particular course or if the number of students who have passed a particular course is less than or equal to 30, absolute grading system will be followed. The letter grade and mark range are given in table below.

| Letter Grade | Mark Range | Grade Point, g |
|---|---|---|
| O | 91 – 100 | 10 |
| A+ | 81 – 90 | 9 |
| A | 71 – 80 | 8 |
| B+ | 61 – 70 | 7 |
| B | 56 – 60 | 6 |
| C | 50 – 55 | 5 |
| RA | < 50 | 0 |
| W(Withdrawal) | 0 | 0 |
| SA (Shortage of Attendance) | 0 | 0 |

"RA" denotes Reappearance in a course.

The grades RA and SA will not figure in the grade sheet.

**c.** For online courses the following grading pattern is applicable in case of credit transfer and CGPA calculations.

| Letter Grade | Mark Range | Grade Point, g |
|---|---|---|
| O | 91 – 100 | 10 |
| A+ | 81 – 90 | 9 |
| A | 71 – 80 | 8 |
| B+ | 61 – 70 | 7 |
| B | 56 – 60 | 6 |
| C | 50 – 55 | 5 |
| RA | < 50 | 0 |
| W(Withdrawal) | 0 | 0 |
| SA (Shortage of Attendance) | 0 | 0 |

**vii. Cumulative Grade Point Average:** After the completion of the programme, the Cumulative GradePoint Average (CGPA) from the first semester to final semester is calculated using the formula.

$$\text{CGPA} = \frac{\sum g_i * C_i}{\sum C_i}$$

where $g_i$ is Grade point secured corresponding for $i^{th}$ course

$C_i$ is Credit allotted for $i^{th}$ course

**viii. Passing a course:**

**a.** A student shall be deemed to have passed any course with CA and FE components, if

i. he/she secures at least 45% of the total marks in the final examination and

ii. he/she secures not less than 50% of total marks [CA and FE put together] prescribed for the course shall be declared to have passed the course and acquired the relevant number of credits.

A student is deemed to have passed in any course carrying only Continuous Assessment marks if the total mark secured by him/her is at least 50% of total marks.

b. A student, who is absent or has failed in the semester end examinations in any course carrying Continuous Assessment and Final Examination has to register for the examination in that course when it is conducted next time either by retaining or by not retaining the CA marks already earned
   i. A student after choosing the option as not retaining CA in second attempt shall have to continue to register for further appearances in the same option only, till he/she obtains a pass
   ii. A student after choosing the option as retaining CA in second attempt may continue to appear for further appearances in that option or at any time can switch over to the option of not retaining the CA which shall be final till he/she obtains a pass

c. A student, who after having earned necessary attendance has failed in any course carrying only continuous assessment marks, will register for the examinations when it is conducted next time and will be solely assessed in the semester end examinations carrying entire marks of that course.

d. A student who has earned necessary attendance in the course Project Phase-2 but does not submit the report on Project Phase-2 on or before the date specified by the college / department, shall be deemed to have failed in the Project Phase-2 and awarded grade RA and will have to register for the same at the beginning of the subsequent semester, redo and submit the project report at the end of that semester and appear for the final examination, the CA mark earned afresh.

e. A student who has earned necessary attendance in the course Project Phase-2 but whose project report is not accepted for reasons of incompleteness or other serious deficiencies will be treated as “absent” and will have to register for the same at the beginning of the subsequent semester, redo and submit the project report at the end of that semester and appear for the final examination, the CA mark earned afresh.

f. A student who has submitted the report on Project Phase-2, but could not appear for the semester end examination on the scheduled date, shall be deemed to have failed in the Project Phase-2 and awarded grade RA and will have to register for the same at the beginning of the subsequent semester, Redo and submit the project report at the end of that semester and appear for the final examinations, the CA mark earned afresh.

g. If a student is absent or has failed in an elective course, he/she may register for the same course as detailed in 8 (b) above or for any other elective in the subsequent semester by registering afresh.

h. A student who is not eligible to write the end semester examination in any course due to lack of attendance, will be awarded grade SA and the student has to register for that course again, when offered next, attend the classes and fulfil the attendance requirements as per section 5 supra. If the course, in which the student has lack of attendance, is a Professional Elective the student may register for the same or any other Professional Elective course in the subsequent semesters.

i. A student after registering for a course may withdraw his / her registration between first & second CA Test on valid reasons.

j. For MBA, out of the required eight Professional Electives to be studied, the student shall study a minimum of six electives from the list of Professional Electives prescribed in their scheme of examinations without fail and can study the remaining two Professional Electives either from the list prescribed in the scheme or as online courses / special courses by obtaining equivalence.

In case, the student completes more than eight Professional Electives, six Professional Electives with highest grade among all the Professional Electives studied under the scheme and two courses with next highest grade among all remaining courses studied by the student will be considered for calculation of CGPA; however the grades obtained in all other left over courses will also appear in the grade sheet.

For MBA (WM&SE), a maximum of two electives can be done online.

k. A student who is absent in the final semester examination of a course after registering for the same will be considered to have appeared and failed in that examination and awarded grade RA.

**ix. Supplementary Examinations:**

For Supplementary Examinations / Examinations for any course under REDO category, absolute grading will be followed irrespective of whether the grading was originally under Relative Grading System or Absolute Grading System.

## 9. QUALIFICATION FOR THE AWARD OF DEGREE

A student will be declared to have qualified for the award of the MBA, MBA (WM&SE) degree provided

i. the student has successfully completed the course requirements and has passed all the prescribed courses of study of the respective programme listed in section 13 infra within the duration specified in section 2(ii) supra and earned the total number of credits as specified in the curriculum of the respective programme of study. However, if the student wishes, he/she may be permitted to earn more than the total number of credits prescribed in the curriculum of his/her programme.

ii. no disciplinary action is pending against the student.

## 10. CLASSIFICATION OF DEGREE

### A) FIRST CLASS WITH DISTINCTION

A student who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction.

- Should have passed the semester end examination in all the courses of all the four semesters in his/her First appearance within 3 years, which includes authorized break of study of one year. Withdrawal from examination (vide clause 11) will not be considered as an appearance.
- Should have secured a CGPA of not less than 8.50.
- One year authorized break of study (if availed of) is included in the three years for award of First class with Distinction.
- Should not have been prevented from writing semester end examination due to lack of attendance in any of the courses.

**B) FIRST CLASS**

A student who satisfies the following condition shall be declared to have passed the examination in First Class.

- Should have passed the examination in all the courses of all four semesters **within three years.**
- One year authorized break of study (if availed of) or prevention from writing the End Semester examination due to lack of attendance (if applicable) is included in the duration of three years for award of First class.
- Should have secured a CGPA of not less than 6.5

**C) SECOND CLASS**

All other students (not covered in clauses 10 A and B) who qualify for the award of the degree shall be declared to have passed the examination in Second class.

**D) RANK**

A student shall be eligible for award of ranking only if he/she has passed the examination in first class or first class with distinction in the first available chance (i.e., first attempt in all the courses). Those who have availed the provision of break of study / withdrawal will not be eligible for ranking.

**11. WITHDRAWAL FROM EXAMINATION**

i. A student may, for valid reasons, be granted permission to withdraw from appearing for the examination in any course or courses of only one semester examination during the entire duration of the degree programme, if he/she does not have any history of arrears at the time of request for withdrawal. Prior permission for withdrawal from semester examinations is to be obtained from Principal. Also, only one application for withdrawal is permitted for that semester examination in which withdrawal is sought.

**ii.** Withdrawal application shall be valid only if the student is otherwise eligible to write the examination and if it is made prior to the commencement of the semester examination or on the day of the examination of a course / set of courses and also recommended by the HoD and the Principal.

**12. TEMPORARY BREAK OF STUDY**

i. Under Choice Based Credit System, students will have the provision to take a break of study at the beginning of a semester to re-do or complete the reappearance courses of previous semesters or on valid reasons (such as accident or hospitalization due to prolonged ill health) and rejoin the programme in a semester which he/she is eligible and he/she shall apply to the Principal through the HoD stating the reasons therefore.
ii. A student permitted for break of study shall rejoin the programme at the respective semester as and when it is offered subject to the approval of Commissioner of Technical Education and Anna University, Chennai and shall be governed by the rules and regulations in force at the time of rejoining.
iii. The duration specified for passing all the courses for the purpose of classification (vide section 10 supra) shall be increased by the period of such break of study permitted.
iv. The total period for completion of the programme reckoned from the commencement of the semester to which the student was first admitted shall not exceed the maximum period specified in section 2 (ii) supra irrespective of the period of break of study in order that he/she may be qualified for the award of the degree.
**v.** If any student is detained for want of requisite attendance, progress and conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' and section 12 (iii) supra is not applicable for such cases

**13. MBA (WM&SE) Schema**

| (Minimum Credits to be earned = 93) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Title** | Hours/Week | | | **Credits** | Maximum | | | **Category** |
| | | **Lecture** | **Tutorial** | **Practical** | | CA | FE | TOTAL | |
| **SEMESTER – I** | | | | | | | | | |
| 21GW11 | Principles of Waste Management | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW12 | Principles and Practices of Management | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW13 | Fundamentals of Operations Management | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW14 | Managerial Economics | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW15 | Financial Accounting | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW16 | Research Methods for Management | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW17 | Business Communication | 0 | 0 | 4 | 2 | 100 | - | 100 | PC |
| 21GW18 | Spreadsheet Applications | 0 | 0 | 2 | 1 | 100 | - | 100 | EEC |
| 21GW19 | Air and Water Analysis Lab | 0 | 0 | 2 | 1 | 100 | - | 100 | EEC |
| **TOTAL** | | **18** | **0** | **8** | **22** | **600** | **300** | **900** | |
| **SEMESTER - II** | | | | | | | | | |
| 21GW21 | Internship I | 0 | 0 | 8 | 4 | 50 | 50 | 100 | EEC |
| 21GW22 | Individual and Organizational Behaviour | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW23 | Waste Management Logistics and Technical Processes and Methods | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW24 | Financial Management | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW25 | Marketing Management | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW26 | Entrepreneurship in Waste Management | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW27 | Physical Fitness through Yoga | 0 | 0 | 2 | 1 | 100 | - | 100 | EEC |
| 21GW28 | Soil and Solid Waste Analysis Lab | 0 | 0 | 2 | 1 | 100 | - | 100 | EEC |
| **TOTAL** | | **15** | **0** | **12** | **21** | **500** | **300** | **800** | |

| Course Code | Course Title | Hours/Week | | | Credits | Maximum | | | Category |
|---|---|---|---|---|---|---|---|---|---|
| | | Lectures | Tutorial | Practical | | CA | FE | TOTAL | |
| **SEMESTER - III** | | | | | | | | | |
| 21GW31 | Internship II | 0 | 0 | 16 | 8 | 50 | 50 | 100 | EEC |
| 21GW32 | Human Resource Management and Organizational Development | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW33 | Strategic Management | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW34 | Regulatory Framework- Legal Aspects and Mandatory Regulations | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21G____ | Elective 1 | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PE |
| 21G____ | Elective 2 | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PE |
| 21GW35 | Health, Fitness and Nutrition for Managers | 0 | 0 | 2 | 1 | 50 | 50 | 100 | EEC |
| 21GW36 | Design Thinking | 0 | 0 | 2 | 1 | 100 | - | 100 | EEC |
| 21GW37 | Energy and Simulation Lab | 0 | 0 | 4 | 2 | 100 | - | 100 | EEC |
| 21GW38 | Audit Course | 2 | 0 | 0 | Grade | 100 | 0 | 100 | MC |
| **TOTAL** | | **17** | **0** | **24** | **27** | **650** | **350** | **1000** | |
| **SEMESTER – IV** | | | | | | | | | |
| 21GW41 | Internship III | 0 | 0 | 8 | 4 | 100 | - | 100 | EEC |
| 21GW42 | Information and Communication Technology & Management Information Systems | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW43 | Waste Management as Project Management and Geographic Information System | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21GW44 | Creativity and Innovation | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PC |
| 21G____ | Elective 3 | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PE |
| 21G____ | Elective 4 | 3 | 0 | 0 | 3 | 50 | 50 | 100 | PE |
| 21GW45 | Managing Contracts | 0 | 0 | 2 | 1 | 100 | - | 100 | EEC |
| 21GW46 | Throughput Accounting and Theory of Constraints | 0 | 0 | 2 | 1 | 100 | - | 100 | EEC |
| 21GW47 | Organic Waste Management Lab | 0 | 0 | 4 | 2 | 100 | - | 100 | EEC |
| **TOTAL** | | **15** | **0** | **16** | **23** | **650** | **250** | **900** | |

**Category: PC – Professional Core, PE – Professional Elective, EEC – Employability Enhancement Course**
**CA- Continuous Assessment, FE- Final Examination**

**LIST OF ELECTIVE COURSES**

| Course Code | Course Title |
|---|---|
| 21GWA1 | Operations and Maintenance |
| 21GWA2 | Environment Impact Assessment |
| 21GWA3 | Environment Economics |
| 21GWA4 | Hotel Waste Management |
| 21GWA5 | Reclamation, Remediation and Capping |
| 21GWA6 | Sanitation and Hygiene |
| 21GWB1 | Market Integration for Waste Management |
| 21GWB2 | Consumer Behaviour |
| 21GWB3 | Integrated Marketing Communication |
| 21GWB4 | Service Marketing |
| 21GWB5 | Product and Brand Management |
| 21GWB6 | Waste Exports, Procedures and Documentation |
| 21GWC1 | E-Waste Management |
| 21GWC2 | Resource Efficiency and Resource Recovery |
| 21GWC3 | Integrated Waste Management |
| 21GWC4 | Bio Medical Waste Management |
| 21GWC5 | Water Resource Management |
| 21GWC6 | Waste Management Banks |
| 21GWC7 | Waste Management Technologies |
| 21GWD1 | Business Analytics |
| 21GWD2 | Data Visualization |
| 21GWD3 | Machine Learning |
| 21GWD4 | Python Programming for Analytics |

# SEMESTER I

**21GW11**
**PRINCIPLES OF WASTE MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To provide insights in basics of environment and waste such as waste characterisation, source reduction and sustainability tools; and to sensitise students about environmental health and individual responsibility in waste management.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall environmental principles and concepts | 3 | 3 | | 3 | | 3 |
| CO2 | Understand waste generation | 3 | 3 | | | | 3 |
| CO3 | Identify the different types of waste | 3 | 3 | | | | |
| CO4 | Examine source reduction and waste disposal practices | 3 | 3 | | | 3 | 3 |
| CO5 | Outline sustainability tools | 3 | 3 | 3 | 3 | | |

**UNIT I :Introduction to Environment:** **9 hrs**

Ecosystem –meaning, - components- Structure – Functions, Levels of organization in nature- Food chain and Trophic structure, Biogeochemical Cycles, Understanding Carrying Capacity and Assimilation Capacity of Earth, UN Sustainable Development Goals, waste movement – cyclic vs linear, innovating techniques to revert from linear to cyclic

**UNIT II : Introduction to Waste Generation:** **9 hrs**

Waste around us, definition, Waste Handling in Previous Ages, Increasing waste piles – indicates inefficient use of raw material; Reasons for increase in waste quantity, Consumption and population, consumption patterns, Exponential growth of consumption, Effects of Excess Waste Generation, Resource depletion, waste disposal vs waste management, Principles of waste management, Rural waste vs Urban Waste; Pollution – types, waste vs pollution, Statistics for exponential growth of waste generation

**UNIT III : Waste Characterisation:** **9 hrs**

Types of waste; geographical waste or regional waste; Solid Waste management tools – techniques for reducing production of waste, managing through segregation and scientific disposal, Ill-effects of mixing of waste, Categories of Solid Wastes - Domestic Waste, Market Waste, Food Waste, Agricultural waste, Fruit- vegetable market waste, e-Waste, Industrial Inert Waste, Industrial Hazardous Waste, Bio-Medical Waste and Radioactive Waste, Hazardous waste, Plastic Waste – spread all over oceans, Managing them at source, Next Generation Waste, inventorisation or projection of waste, Domestic waste vs industrial waste; Domestic waste vs institutional waste, C & D waste, Laboratory waste management; non-routine waste(like festivals or functions)

**UNIT IV : Source Reduction & Waste Disposal Practices:** **9 hrs**

Source Reduction, Waste reduction strategies, Economic benefits, Demarcations between Source Reduction and Waste Reduction, Operation on a daily basis, Waste Reduction Program Guideline, Importance of source reduction, Economic benefits of waste reduction, Operation on a daily basis, Innovations examples of waste reduction

Waste Disposal Practices: Conventional Practices vs Modern Practices; Dumping off wastes; Landfill, Recycling; Biological Recycling; Recovery for Energy; Incineration

Urban growth – Municipal management – Administrative framework – Present scenario of solid waste management in ULBs and Rural areas – Current practices and deficiencies in SWM

**UNIT V : Sustainability Tools:** **9 hrs**

Life Cycle Analysis, Extended Producer Responsibility, Corporate Social Responsibility in waste management.

**TOTAL : 45 hrs**

**Reference Books:**


1. Syed.E.Hasan, "Introduction to Waste Management", 1st Edition, Wiley-Blackwell Publications, 2020
2. Pichtel, John, "Waste Management Practices", CRC Press, 2014
3. SunitaNarain, Swati Singh Sambyal, "Not in My Backyard - Solid Waste Management in Indian Cities", Centre for Science & Environment, 2018
4. George et al. "Integrated Solid Waste Management – Engineering Principles and Management Issues", Mc. Graw Hill, 2014
5. T.V.RamaChandra, Vijay Kulkarni, "Environmental Engineering Series - Environmental Management", Capital Publishing Co, 2006.

**21GW12**
**PRINCIPLES AND PRACTICES OF MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To facilitate students to recognise the functions and responsibilities of managers and to analyse and understand the business environment.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall basic principles and concepts of management | 3 | 3 | | | 3 | 3 |
| CO2 | Understand the management function of planning | | 3 | 3 | | | |
| CO3 | Outline the basics of organizing, staffing and directing | | 3 | 3 | | | |
| CO4 | Explain the management function of controlling | | 3 | 3 | | | |
| CO5 | Recognise the factors for successful managerial communication | 3 | 3 | 3 | 3 | | |

**UNIT I : Introduction to Management** **9 hrs**

Introduction to Management: Management - Meaning, nature, scope and importance of Management, productivity, Management as a Science, Art or a Profession, Universality of Management, Management Principles, Functions of management, Management roles, Levels of Management, Management Skills, Social Responsibility, Ethics and Values in Management, Corporate Social Responsibility, Corporate Governance, Management Vs Administration, Evolution of Management thought- Scientific Management, Fayol's Principles of Management, Hawthorne Experiments, Decision Theory Approach, System Approach, Contingent Approach, Contribution of Peter Drucker.

**UNIT II :Planning** **9 hrs**

Planning – Meaning, nature and importance, Planning Process, Types of Planning, Measures of effective Planning, Barriers to Effective Plan, Management by Objectives; Decision Making - Meaning, Types of decisions, Decision Making Process, Individual Vs Group Decision Making, Decision Making Conditions, Creativity

**UNIT III : Organizing, Staffing and Directing** **9 hrs**

Organizing - Meaning, Organization Structure, forms of Organization Structure, Departmentation, Task Force, Virtual Organization, power, authority, accountability, delegation, centralization, decentralization, working team, team effectiveness, dynamics of group behaviour, influence of group on individual and group decision making, Staffing- Meaning, man power planning, job analysis, job description, job specification, recruitment and selection, training and development, transactional analysis, organization development, performance appraisal, job evaluation. Directing– Meaning, nature, scope and principles of direction, supervision

**UNIT IV :Controlling** **9 hrs**

Controlling: Meaning, importance, controlling process, types of control, essential of effective control system, behavioural importance of control, control techniques, quality circles, Budgetary and Non-budgetary control. Leadership - Meaning, importance, leadership theories, leadership styles – managerial grid, tri- dimensional grid, leadership as a continuum

**UNIT V : Communication** **9 hrs**

Communication - Meaning, process, oral, written, Non-verbal, pictorial communication, communication channel, barriers in communication. Communication in Business: Importance and benefits, components – concepts and problems-nonverbal communication – The seven Cs of effective communication: Completeness, Conciseness, consideration, concreteness, clarity, courtesy and correctness – Business Communication in the Global Context: Background to inter-cultural communication - cultural variables, individual cultural variables Forms of Communication: Personal, Interpersonal, Technology & Communication, Communication for Organizational Effectiveness

**TOTAL : 45 hrs**

**Reference Books:**


1. George Phirippidis, "The Six Functions of Management: A practical action planning guide for people in management", Kerr Hill, Incorporated, 1st Edition, 2014.
2. Harold Koontz, Heinz Weihrich, Mark V. Cannice, "Essentials of Management - An International, Innovation and Leadership Perspective", 11th Edition. McGraw-Hill Education, 2020
3. Koontz, Weihrich "Essentials of Management", Tata McGraw Hill,2015
4. L.M. Prasad "Principles & Practices of Management", Sultan Chand and sons, New Delhi, 2019.
5. Tony Morden,, Principles of Management , Routledge Publications, 2nd Edition, 2017

**21GW13**
**FUNDAMENTALS OF OPERATIONS MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To make students understand the importance of production planning and control in organizations and to calculate optimal costs of mandatory expenses.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the basics for locating business facilities and how to plan optimum layouts for efficient production | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | State the principles and concepts in product and service design | 3 | 3 | | | 3 | |
| CO3 | Recollect the tools and techniques for Quality Improvement | 3 | 3 | | | 3 | |
| CO4 | Outline inventory management practices | 3 | 3 | | | 3 | |
| CO5 | Solve problems related to assignment and linear programming | 3 | 3 | | | 3 | |

**UNIT I :Facilities Location and Layout & Production Planning and Control** **9 hrs**
Strategic Importance, Factors affecting Locations (and related problems) and Layout, Installation of facilities, Single Location and Multi location Decisions, Principles and Types of facilities layout. Production Planning and Control : Production Planning Techniques for various Process Choices, Techniques of production control, aggregate planning techniques, Master Production Schedule (MPS); Product Scheduling, Scheduling Procedure and Techniques.

**UNIT II :Product and Service Design** **9 hrs**
Origin of the Product Idea and Selection from Various Alternatives, Characteristics of a Good Design, Process Design, Type of Process Designs, Process Planning Procedure.

**UNIT III :Quality Management** **9 hrs**
Introduction, Meaning, Quality Characteristics of Goods and Services Tools and Techniques for Quality Improvement – Check Sheet, Histogram, Scatter Diagram, Cause and Effect Diagram, Pareto Chart, Statistical Control Chart, Quality assurance, Total Quality management, Model, Service Quality, Concept of Six Sigma and its Application; Maintenance: TPM: Total Productive Maintenance (TPM), Meaning and Objectives of TPM, Methodology of TPM, Advantages of TPM.

**UNIT IV :Inventory Management** **9 hrs**
Key Processes to Eliminate Waste, Implementation of JIT, Pre-requisites for implementation, JIT Inventory and Supply Chains Functions of Materials Management, Purchase Management, The Methods of Purchasing, Purchasing Procedure; Inventory Management and Coding , Related problems

**UNIT V :Problem Solving** **9 hrs**

Problems on Transportation, Problems on Assignment, Linear Programming Problems- Formulation and Solving, Problems on Network Modelling, PERT, CPM

**TOTAL : 45 hrs**

**Reference Books:**


1. William J Stevenson, "Operations Management", McGraw Hill Education, 13th Edition, 2018
2. K Aswathappa, G Sudarsana Reddy "Production and Operations Management", Himalaya Publishing house, 2017
3. S. N. Chary, "Production and Operations Management", McGraw Hill Education., 6th Edition, 2019.
4. Mahadevan B, "Operations Management: Theory and Practice", Pearson Education, 3rd Edition, 2015.
5. Russell R, Taylor B W, "Operations Management", Wiley Publications, 9th Edition, 2016.

**21GW14**
**MANAGERIAL ECONOMICS**

**3 0 0 3**

**Learning Objective(s):** To help students understand the concepts of Economics such as Supply and Demand, Cost and Pricing, Theory of Consumer Behaviour, Monopoly, Duopoly, Oligopoly and Monopolistic Competition.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall basic principles and concepts of managerial economics | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | Understand the production function | 3 | 3 | | | 3 | |
| CO3 | Recognise the relationship between production and cost | 3 | 3 | | | 3 | |
| CO4 | Recollect the concepts under market structure | 3 | 3 | | | 3 | |
| CO5 | Explain about externalities and market regulation | 3 | 3 | | | | |

**UNIT I :Managerial Economics** **9 hrs**

Ten Principles of Economics, Market Forces of Demand and Supply, Elasticity and its applications. Revenue, Cost and Pricing. Theory of Demand: Indifference Curve Approach and Utility theory, Marginal analysis, Theory of Consumer, Determinants of Demand, Modelling Consumer Demand, Forecasting Consumer Demand, Elasticity of Demand, Consumer Decisions in the Short Run and Long Run.

**UNIT II :Production Function** **9 hrs**

Cost Approach v/s Resource Approach to Production Planning, Economies of Scope and Joint Products, Marginal Cost of Inputs and Economic Rent, Marginal Revenue Product and Derived Demand, Horizontal Integration, Vertical Integration, Transfer Costs, Cost Centre v/s Profit Centre. Market Equilibrium, Shifts in Supply and Demand Curves.

**UNIT III :Theory of Production and Cost** **9 hrs**

Production with one and two variable inputs, cost concepts, short and long run cost functions, production function in short and long run, economies of scale and scope.

**UNIT IV :Market Structure** **9 hrs**

Perfect Competition, Why it is desirable? Imperfect Competition, Monopolistic Competition, Monopoly, Oligopoly, Duopoly, Oligopoly and Cartels, Production Decisions in Non-Cartel Oligopolies, Seller Concentration, Competing in Tight Oligopolies: Pricing Strategies – transparency in cost of production with respect to cost of land, Buyer Power, Firm Strategies in Highly Competitive Markets.

**UNIT V :Market Externalities** **9 hrs**

Importance of economic and social equity. Free Market Economies v/s Collectivist Economies, Efficiency and Equity, Circumstances under which Market Regulation is desirable, Regulation to Offset Power of Seller and Buyers, Natural Monopoly, Externalities, Externality Taxes, High Cost to Initial Entrant and the Risk of Free Rider Products, Limitations of Market Regulation

**TOTAL : 45 hrs**

**Reference Books:**


1. Baumol, W. J., Panzar, J. C., &Willig, R. J, "Contestable markets and the theory of industry structure", San Diego, CA: Harcourt Brace Jovanovich. Journal, 1982.
2. Coase, R. H. "The nature of the firm", Economica 4(16), 386–405, 1937
3. Karl E. Case, Ray C. Fair, Sharon Oster, "Principles of Economics", Pearson Education, 12th Edition, 2017
4. Christopher R. Thomas and S Charles Maurice, "Managerial Economics", Tata McGraw Hill Education,12th Edition, 2020.
5. D M Mithani, "Managerial Economics: Theory and Applications", Himalaya Publishing house, 8th edition. 2016.

**21GW15**
**FINANCIAL ACCOUNTING**

**3 0 0 3**

**Learning Objective(s):** To enable students to understand, analyse and interpret information provided by financial statements manually and using software.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall basic principles and concepts of financial accounting | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | Read and understand P&L statements, cash flow statements and balance sheets | 3 | 3 | | 3 | 3 | |
| CO3 | Recollect the tools of financial analysis | 3 | 3 | | | 3 | |
| CO4 | Explain the basics of cost accounting | 3 | 3 | | | 3 | |
| CO5 | Review regulatory and statutory compliances | 3 | 3 | | 3 | 3 | |

**UNIT I :Introduction to Financial Accounting** **9 hrs**

Accounting and its functions, Accounting as an information system, Basic Accounting Concepts and Accounting Conventions, Accounting Principles, Generally Accepted Accounting Policies (GAAP), Accounting Standards, Accounting Structure, Types of Accounts. Rules regarding Journal Entries, Recording of Journal Entries, Ledger Posting, Cash book, Trial Balance

**UNIT II :Preparation of Final Accounts** **9 hrs**

Preparation of Final Accounts, Trading Account, Profit & Loss Account, Balance Sheet, Treatment of Adjustments into trial balance. Accounting for Non-Profit Organizations

**UNIT III :Financial Statement Analysis** **9 hrs**

Meaning and Objectives of Financial Statement Analysis, Limitation of Financial Analysis. Tools of financial analysis: Ratio analysis-liquidity, solvency, performance and profitability, Common size statements, Trend analysis, Fund flow and cash flow statement.

**UNIT IV :Cost Accounting** **9 hrs**

Cost Accounting, Elements of cost, Cost sheet, Budgeting and Budgetary control, CVP analysis, Break even and decision making tools. Components of cost due to use of land, Pay lease rental for the land and not allow ownership

**UNIT V :Regulatory and Statutory Compliances, System and control** **9 hrs**

Importance of systems and control, direct taxation-IT, Indirect Taxation-GST. Application of Software: Application of Software: Tally Latest Version, GST based accounting software

**TOTAL : 45 hrs**

**Reference Books:**


1. Charles T. Horngren, Gary L. Sundem, John A. Elliott and Donna Philbrick, "Introduction to Financial Accounting", Prentice Hall India, 10th Edition, 2012.
2. Hanif Mukherjee, "Financial Accounting", Tata McGraw Hill. 4th Edition, 2018.
3. Khan, MY, Jain, PK, "Management Accounting", Tata McGraw Hill, 7th Edition, 2017.
4. Gupta, Ambrish, Financial Accounting for Management-An Analytical Perspective, Pearson Education,5th Edition, 2016.
5. R.Naranaswamy,"Financial Accounting-A managerial Perspective", 6th Edition, Prentice Hall India. 2017.

**21GW16**
**RESEARCH METHODS FOR MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To facilitate students to practice and conduct research.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recollect basic principles and concepts of research methods | 3 | 3 | | 3 | 3 | 3 |
| CO2 | Demonstrate different sampling techniques | 3 | 3 | | 3 | | |
| CO3 | Outline the basics of statistical concepts | 3 | | | | | |
| CO4 | Perform correlation analysis | 3 | 3 | | 3 | | |
| CO5 | Collect and examine data and prepare research reports | | | | 3 | 3 | |

**UNIT I :Introduction to Research methods** **9 hrs**

Concept, Role, nature, scope, need, objectives and managerial value of research, Types of research, Research process, Problems encountered by researcher Understanding the language of research: concept, construct, definition, variable Research Design: Concept, need, importance and feature of a good research design, Different research designs (Exploratory, Descriptive, Experimental and Diagnostic research) – Concept, types and uses

**UNIT II :Sampling** **9 hrs**

Concept of statistical population, sample, sampling frame, sampling error, sample size, characteristic of a good sample; Types of sampling: Probability sampling – simple random sampling, stratified sampling, cluster sampling, systematic sampling, and Multi-stage sampling. Non- probability sampling – Judgment sampling, convenience sampling and quota sampling; Attitude Scaling Techniques: concept of scale, Rating scales – Likert scales, semantic differential scales and Graphic rating scales; Measurement: Concept of measurement, Level of measurement – Nominal, Ordinal, Interval, and ratio Types of data: Primary data and Secondary data Primary data– definition, Advantages and disadvantages over secondary data; Secondary data– definitions, sources, characteristics; Methods and tools for data collection

**UNIT III :Introduction to Statistics** **9 hrs**

Meaning and definitions of statistics, scope and limitations of statistics, Role of statistics in Management decisions; Measures of Central Tendency: Mean, Median, Mode, Percentile and Quartiles; Measures of Dispersion: Range, Inter-quartile Range, Quartile Deviation, Mean Deviation, Standard Deviation, Variance and Coefficient of variation.

Probability and Testing of Hypothesis: Basic Concept and approaches of probability, Additive and Multiplicative law of probability, Conditional probability rules, Baye's Theorem; Probability distributions: Meaning, Types and Applications of Binomial, Poisson and Normal distributions. Hypothesis testing and statistical influence (Introduction to methodology and types of errors), Introduction to sample tests for univariate and bivariate analysis using Normal distribution, F-test, t-test, Z-test and Chi-Square test.

**UNIT IV :Correlation Analysis** **9 hrs**

Meaning and types of correlation, Karl Pearson's coefficient of correlation, Spearman's Rank correlation; Regression Analysis: Meaning and two lines of regression, Relationship between correlation and regression coefficients; Time series Analysis: Time series and its components, Methods of studying components of Time Series, Measurement of trend (Moving Average, Exponential Smoothing and Least Square method); Participatory Action Research (PAR): Principles, Dangers and Drawbacks of Participatory Approaches, Application of PAR in rural and urban setting, Tools of PAR: Wealth Ranking, Timeline, Transect Walk, Seasonality, Social and Resource Mapping, Venn Diagram and Focus Group Discussion.

**UNIT V :Data Analysis** **9 hrs**

Editing, coding, Classification and Tabulation; Data Analysis –Various kinds of charts and diagrams used in data analysis, Application of statistical techniques for analysing the data, different statistical tests for hypothesis testing, MCDM techniques, Report writing– Significance of report writing, steps in report writing, layout of research report and precautions in writing research reports.

**TOTAL : 45 hrs**

**Reference Books:**


1. Donald R. Cooper, Pamela S. Schindler and J K Sharma, "Business Research Methods", McGraw Hill Education (India) Private Limited, New Delhi. 12th Edition, 2018.
2. Bryman, A. and Bell, E, "Business research methods", Oxford University Press, 4th Edition, 2016.
3. Hooda, R.P.."Statistics for Business and Economics", 5th edition, Vikas Publishing House, 2013.
4. Uma Sekaran and Roger Bougie, "Research Methods for Business: A skill building approach", Wiley India, New Delhi. 7th Edition, 2018.
5. Bajpai, N., "Business Research Methods", Pearson Education, 2nd Edition, 2017.

**21GW17**
**BUSINESS COMMUNICATION**

**0 0 4 2**

**Learning Objective(s):** To facilitate students to understand and demonstrate the use of basic and advanced proper oral and writing techniques.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall knowledge of communication theory and application. | 3 | | | 3 | 3 | |
| CO2 | Display competence in oral, written, and visual communication. | 3 | | | 3 | | |
| CO3 | Respond effectively to cultural communication differences. | 3 | 3 | | 3 | 3 | |
| CO4 | Use technology to communicate effectively in business settings. | | | | 3 | | |
| CO5 | Demonstrate professional and ethical behavior. | | | 3 | | 3 | |

**UNIT I : Communication Framework:** **6 hrs**

Communication definition - Process of Communication - Importance of Feedback - Giving and Receiving Feedback - Communication Networks in Organizations and their importance - Barriers to Communication and Gateways to overcome

**UNIT II : Written Communication Strategies:** **6 hrs**

Style and Tone in Writing - Three-Step Writing Process for Business Messages - Reports and Proposals – Agenda – Minutes – Circulars – Notices – Memorandum - Strategies for Neutral and Positive messages - Negative messages - Persuasive messages

**UNIT III : Nonverbal Communication and Listening Skills:** **6 hrs**

Definition - Importance of Nonverbal Communication - Classification of Nonverbal Communication and its implications - Process of Listening - Importance of Listening - Classification of Listening - Barriers to Listening and implications.

**UNIT IV : Interpersonal and Intercultural Communication:** **6 hrs**

Developing and Building Teams - Key Dimensions of Team Communication - Characteristics of Effective Teams - Communication Strategies for Groups and Teams - Business Etiquettes - Understanding Cultural Diversity - Adapting to other Business Cultures
- Improving Intercultural Communication Skills.

**UNIT V : Oral Presentation Skills:** **6 hrs**

Identifying the Purpose and Topic - Analyzing the Audience - Collecting and Organizing the Content - Preparing the Visual Aids - Proof Reading and Delivering the Presentation.

**TOTAL : 30 hrs**

**Reference Books:**


1. Courtland L Bovee, John V Thill and Abha Chatterjee, "Business Communication Today", Pearson Education, 10th edition, 2011
2. Raymond Lesikar, Marie E Flatley, Kathryn Rentz, NeerjaPande, "Business Communication", Tata McGraw-Hill Publishing Company Limited, 11th edition, 2001
3. Monippally M M, "Business Communication – From Principles to Practice", McGraw Hill Education (India) Pvt Ltd., 1st edition, 2013.
4. Pfeiffer, W S and Padmaja T V S., "Technical Communication – A Practical Approach", Pearson Education, 6th edition, 2007
5. Taylor, S and Chandra V , "Communication for Business: A Practical Approach", Pearson Education, 4th edition, 2013.

**21GW18**
**SPREADSHEET APPLICATIONS**

**0 0 2 1**

Learning Objective(s): This course enables students to automate common tasks using spreadsheets, apply advanced analysis techniques using large complex datasets and perform collaborative tasks on worksheets.

| CO # | CO-PO MAPPING | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
|---|---|---|---|---|---|---|---|
| | At the end of the course, the students should be able to | | | | | | |
| CO1 | Understand Spreadsheet environment and visualize data | | 3 | | | | |
| CO2 | Apply excel cell references and write formulas to solve problems | | 3 | | | | |
| CO3 | Demonstrate data mining and collaborative tasks using multiple worksheets | | | | 3 | | |

**UNIT I: Spreadsheet Environment** **10 hrs**

Basic text and cell formatting – Selecting ranges - Freeze pane – Using comments – Text functions for purification of large dataset – Date format and conversion - Auto completion of series - Table formatting and highlighting - Conditional formatting –Visualizing data using graphs - Working with multiple worksheets

**UNIT II: Formulas and Functions** **10 hrs**

Auto filter and custom filter – Auto sort and custom sort - Relative and absolute cell references – Writing formulas – Logical Operators - Lookup function – Index command - Statistical functions - Financial functions

**UNIT III: Advanced Functions** **10 hrs**

Scenario manager - Goal seek – Sensitivity analysis - Data table - Solver, Analysis Tool Pak - Data mining using Pivot Tables – Data validation – Working with validation formula – Sharing workbooks : Highlighting changes, Reviewing changes Security features : Unlocking cells, Worksheet protection, Workbook protection

**TOTAL :30 hrs**

**Reference Books**


1. Arora Ritu, “Advance excel 2016 training guide”, BPB Publications, 2nd edition 2017
2. David, M., Levine, S., David, F. S., & Kathryn, A., “Statistics for Managers Using Microsoft Excel”, Pearson Education Limited, 8th edition, 2016
3. John Walkenbach, “Microsoft Excel 2016 Bible: The Comprehensive Tutorial Resource”, Wiley Publications, 1st edition , 2015
4. Michael Alexander, “Microsoft Excel Power Pivot & Power Query For Dummies”, Wiley Publications, 6th edition, 2016
5. Wayne L. Winston, “Microsoft Excel 2016 - Data Analysis and Business Modeling”, PHI Learning, 1st edition , 2017

**21GW19**
**AIR AND WATER ANALYSIS LAB**

**0 0 2 1**

**Air sampling and testing** **15 hrs**

Ambient air sampling and sample collection methods using air sampler; Estimation of PM10, PM2.5, Carbon monoxide, sulphur oxides and oxides of nitrogen in ambient air; Wind rose diagram: Collection and analysis of wind data; Particulate and gaseous pollutants (Heavy metals, Pesticides and PAH)

**Water and Wastewater analysis** **15 hrs**

Methods of sampling and sample preservation techniques, Determination of physico-chemical properties of water : pH, Conductivity, TDS, Total Solids, total volatile solids, turbidity, Alkalinity, Acidity , Hardness , sodium, potassium, Calcium, Magnesium, Chloride, Sulphate, Phosphate, available and total nitrogen, BOD, COD; Determination of the dissolved gases : DO, CO2 and Residual Chlorine; Determination ofthe microbial water quality : MPN Test; Basic water and waste water treatment techniques (Jar test, sand filtration and activated carbon filtration, MLSS and MLVSS )

**TOTAL : 30 hrs**

# SEMESTER II

**21GW21**
**INTERNSHIP I**

**0 0 8 4**

Students are to undergo a field immersion experiential internship spanning 120 hours over the semester II. They are to submit field visit learning reports and submit a comprehensive report at the end of the semester. Students will be allotted a faculty guide to keep track of the same and evaluate the learning progress through the semester. At the end of the semester, there will be a comprehensive evaluation based on the report and a viva voce conducted by a suitable evaluation committee appointed by the HoD.

**21GW22**
**INDIVIDUAL AND ORGANIZATIONAL BEHAVIOUR**

**3 0 0 3**

**Learning Objective(s):** To provide a basic understanding of Organizational behaviour (OB) – Evolution, challenges, opportunities, and Individual Behaviour- Values, types, Attitudes, Personality- Meaning, determinants, traits, and perception.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall basic principles and concepts of individual and organisational behaviour | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | Understand the facets influencing individual behaviour such as values, attitudes | 3 | 3 | 3 | | | |
| CO3 | Outline the foundations of group behaviour | 3 | | 3 | | | |
| CO4 | Recognise and prescribe OD interventions | 3 | 3 | | | | |
| CO5 | Elaborate on organisational culture and the change process | 3 | | 3 | | | |

**UNIT I :Introduction** **9 hrs**

Organizational Behaviour- Concept and Importance, Historical Development of O.B., Contributing disciplines to the O.B. field, Challenges and Opportunities for O.B., Models of O.B.

**UNIT II :Individual Behaviour** **9 hrs**

Values: Importance, types, values across culture, Attitudes: Types, cognitive dissonance theory, measuring attitude, Personality: Meaning, determinants, traits, major personality attitudes influencing O.B., Perception - Meaning, factors influencing perception, person perception, Emotions and stress, learning- Kurt Lewin's theory of learning.

**UNIT III :Group Behaviour** **9 hrs**

Foundations of Group behaviour, Defining and classifying groups, stages of group development, Group structure, Group decision making, Negotiation and Conflict Management, Understanding work teams, Difference between Groups and teams, types of teams, creating effective teams, turning individual into team players.

**UNIT IV :Organizational Process- Organizational Development** **9 hrs**

Concept, Scope, practice and process of organizational Development interventions, Personal, Interpersonal, group process, in Organizational development, Team Building and team development, Power and Politics, Case study & simulation exercise**.**

**UNIT V :Organizational Culture and Change** **9 hrs**

Definition, culture's functions, creating and sustaining culture, how employees learn culture, creating an ethical organizational culture, creating a Customer responsive culture, Organizational change, forces for change, resistance to change, managing, organizational change, Empowerment and quality of work life

**TOTAL : 45 hrs**

**Reference Books:**


1. Aswathappa, K. "Human Resource Management: Text & Cases", 8th Edition, Tata McGraw Hill Education Private Limited, 2017
2. Schein, E "Organisational socialization and the profession of management," Industrial management review, 9(1), 1-15. 1968.
3. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, "Organizational Behaviour", Pearson, 13th Edition, 2017.
4. Suja R. Nair, "Organisational Behaviour", Himalaya Publishing House, 1st Edition, 2010.
5. Hersey, P., Blanchard, K. H., & Johnson, D. E., "Management of Organizational Behaviour: Leading Human Resources", Pearson, 2013.

**21GW23**

**WASTE MANAGEMENT LOGISTICS AND TECHNICAL PROCESSES AND METHODS**

**3 0 0 3**

**Learning Objective(s):** To provide insights about logistics and importance of waste technical processing, responsibility of waste management and waste reduction.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Enumerate the components of logistics | 3 | | | 3 | | 3 |
| CO2 | Understand the basics of inventorization | 3 | | | 3 | | |
| CO3 | Determine a plan for collection and transportation of different types of waste | 3 | 3 | | | 3 | |
| CO4 | Prescribe storage designs and processing steps for waste | 3 | 3 | | | 3 | 3 |
| CO5 | Devise ways to use and reduce waste | 3 | | 3 | | 3 | 3 |

**UNIT I :Components of Logistics** **9 hrs**

Introduction to Waste Management Logistics, importance, methods of logistics, Human Components, Technological Components- Waste Handling Equipment and Technology, and Managerial Goals, Steps in waste management logistics. Basics of GPS & GIS - introduction, importance; GPS aided vehicle; GPS in India, US, Russia

**UNIT II :Inventorization** **9 hrs**

Inventorization- understanding, sources, kinds of waste, quantity of waste; social mapping; waste generation estimation for zonal wise; allocation of collection vehicle according to waste generation; large vehicle for market & households; Source segregation implementation – different collecting vehicles

**UNIT III :Collection and Transportation** **9 hrs**

GIS & GPS add here Route optimization, planning, scheduling time, dynamic dispatching, mobile communication, performance auditing and GPS real-time asset tracking, Savings and efficiency, improved service levels, Variable cycle (multi-day, weekly, bi-weekly, monthly, quarterly),Variable route start location, Route Optimization, scheduling, GPS tracking, mobile communications, Categorisation of waste recycling, Economics of recycling, Success stories in recycling / reuse, accurate mapping for route; AHP (Analytical Hierarchy Process) use with GIS; best practices followed by firms in reverse logistics/ reverse supply chain of waste; unique challenges

**UNIT IV :Storage and Processing** **9 hrs**

Inventory and material management, Management of Waste Collection, Segregation, Manifest, Transport, Preventive Maintenance, Source segregation management, Management at transfer stations, tertiary transfer Composting –Types and Processes, General Process of Recycling, Precautions for Recycling – Aluminium, Glass, Precautions while Recycling of Plastics, Precautions while Recycling paper, Re-use, Treatment, Disposal

**UNIT V :Trade of Waste** **9 hrs**

Logistics chain in regional and global level, cradle to grave for producers (industries), managing non-routine waste, agricultural waste, Polluter Pays Principle, Extended Producer Responsibility, Producer Responsibility Organization, Carrying Capacity, precautionary principle, reverse logistics, scrap trade; International Trade of WasteInitiatives taken by firms& government to do 3R; implications for business – reducing weight of products impact on the supply chain

**TOTAL : 45 hrs**

**Reference Books:**


1. John Pichtel , " Waste Management Practices", CRC Press; 2 edition, 2014.
2. Mateusz Jakubiak , AGH Krakowie, "Reverse logistics in waste management from landfilling on streets to sustainable waste management and "zero waste" strategy", LOGISTYKA 4:8990-8996, 2015.
3. P.S Ajith& Dr P.N. Hari Kumar, "Solid Waste Management of Municipalities", Abhjeet publications, 1 st edition, 2016.
4. Trevor M. Letcher, Daniel A. Vallero, "Waste: A Handbook for Management", Second Edition, academic press, 2001.

**21GW24**
**FINANCIAL MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To the students to apply concepts and applications pertaining to financial management including investment, dividend, and financial decisions.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall basic principles and concepts of financial management | 3 | 3 | | 3 | 3 | 3 |
| CO2 | Interpret and evaluate investment decisions | 3 | 3 | | 3 | 3 | |
| CO3 | Outline the fundamentals of working capital management | 3 | 3 | | | 3 | |
| CO4 | Understand the cost of capital and capital structure | 3 | 3 | | | 3 | |
| CO5 | Evaluate dividend decisions | 3 | 3 | | | 3 | |

**UNIT I :Introduction to Financial Management** **9 hrs**

Introduction to Financial Management, Concept of time value of money and annuities, Introduction to risk and returns, Types of business organizations, proprietor, partnership, LLP, Companies, OPC, etc. Regulators, credit rating agencies. Calculation of Present value and future value of single cash flow, multiple cash flows, annuity and perpetuity. Determination of Project Cost and Cash flows- Project cost estimation, project financials, project cash flows

**UNIT II :Investment Decisions** **9 hrs**

Capital budgeting techniques-traditional and discounted techniques, Management of Working Capital: Meaning of WC, Need of WC Management, Determinants of WC, Operating Cycle, Estimation of WC. Sources of Funds- LT sources- equity debt, hybrid sources, PE funding, Venture capital, IPO, ECB, Angel Funding. Short term sources, leasing, hire purchase

**UNIT III :Management of Working Capital** **9 hrs**

Working Capital Financing: Trade credit, bank finance, commercial paper, factoring, and money market instruments.

**UNIT IV :Cost of Capital and Capital Structure** **9 hrs**

Cost of equity capital, Cost of preference shares, Cost of debt and weighted average cost, Capital structure theories, Concepts of operating, financial and total leverage

**UNIT V :Dividend Decisions** **9 hrs**

Types of dividends, factors influencing dividends, dividend theories. Business Evaluation: Income approach method, market approach method

**TOTAL : 45 hrs**

**Reference Books:**


1. I.M. Pandey: Financial Management, Vikas Publishing House, 11th Edition, 2016.
2. Chandra, Prasanna, "Financial Management - Theory and Practice", McGraw Hill, 9th Edition, 2017.
3. Khan, MY, Jain, PK, "Financial Management", Tata McGraw Hill, 8th Edition, 2019
4. Van Horne, James and Wachowicz, "Financial Management and Policy", Prentice Hall of India Private Ltd, 12th Edition, 2011.
5. Richard A. Brearley and Stewart C. Myres, "Principles of Corporate Finance", McGraw Hill, 12th Edition, 2013.

**21GW25**
**MARKETING MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To provide an understanding of Waste Marketing issues and concepts, Consumer Behaviour and its limitations and to create awareness about Communication Channels, Market Feedback and importance of Social Marketing in Settings.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall basic principles and concepts of marketing management | 3 | 3 | | 3 | 3 | 3 |
| CO2 | Understand the marketing strategies with emphasis on pricing | 3 | 3 | | 3 | 3 | |
| CO3 | Characterise systems and channels for communication and distribution | 3 | 3 | | 3 | 3 | |
| CO4 | Appreciate the significance of ICT in marketing | 3 | 3 | | 3 | 3 | |
| CO5 | Recognise the institutions and practices that will ensure market support | 3 | 3 | | | 3 | |

**UNIT I :Overview of Marketing** **9 hrs**

Meaning and definition of Solid Waste Markets. Issues in Waste Marketing. Consumer Behaviour, product categories in waste management, product or service or combination, 4 Ps and 7 Ps of product and service marketing. Branding the product, product features

**UNIT II :Marketing Strategy** **9 hrs**

Evolving Waste Marketing Strategy; role of informal sector in solid waste management, pricing of the product / service, pricing strategies, Determinants of price, types or levels of products, value creation in product, value chain analysis

**UNIT III :Distribution Systems** **9 hrs**

Solid Waste Communication and Distribution systems, marketing, cost of channels of distribution, management in solid waste

**UNIT IV :ICTs in Marketing** **9 hrs**

ICTs in waste Marketing, Role of Social Media, promotion mix elements, role of contemporary modes of marketing communications

**UNIT V :Market support** **9 hrs**

Role of commercial bank, Credit and Marketing linkages, identifying waste management industry stakeholders, creating awareness within stakeholders for the product or service, generating a standard on-going feedback system for improvements

**TOTAL : 45 hrs**

**Reference Books:**


1. Paul Baines. "Marketing", Oxford University Press, 2nd Edition, 2013.
2. RamaswamyNamakumari. " Marketing Management", Sage Publications, 6th Edition, 2018
3. Philip Kotler. "Marketing Management – A South Asian Perspective" Pearson Education, 15th Edition., 2017
4. Iacobucci Dawn, "Marketing Management", Cengage Publications, 5th Edition., 2018.
5. RajanSaxena, "Marketing Management", McGraw Hill, New Delhi, 5th Edition, 2017

**21GW26**

**ENTREPRENEURSHIP IN WASTE MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To understand Entrepreneurship in Waste Management, appreciate Entrepreneurial Inputs, Micro Entrepreneurial Systems in the context of managing waste and have basic understanding about financing, issues and limitations of managing waste.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | State the basic principles and concepts of entrepreneurship | 3 | 3 | | | 3 | 3 |
| CO2 | Understand entrepreneurial behaviour and motivation | | 3 | 3 | | 3 | 3 |
| CO3 | Formulate a process for identifying opportunities and business barriers | | 3 | | 3 | 3 | 3 |
| CO4 | Specifically examine waste management opportunities | | | | | | 3 |
| CO5 | Evaluate different types of business models | | 3 | 3 | | 3 | 3 |

**UNIT I :Introduction to Entrepreneurship, Entrepreneurial Traits, Types & Significance 9 hrs**

Definitions, Evolution, Characteristics of entrepreneur and entrepreneurship; Qualities and functions of entrepreneurs, Difference between entrepreneur, leader, businessman and Manager; Types of entrepreneur; Factors influencing entrepreneurship: Individual factors- Environmental factors- Socio- cultural factors- Support systems- Entrepreneurial motivation Role and importance of entrepreneur in economic growth. Entrepreneurship as a style of management. Cases of Entrepreneurship Culture.

**UNIT II :Entrepreneurial Inputs 9 hrs**

N-Achievement and Entrepreneurial success; Entrepreneurial Behaviours and entrepreneurial motivation Locus of control, Innovation and entrepreneur, sources of Innovation; Management of Innovation, creativity and risk taking. Case study & Simulation exercise, Systems thinking perspectives to SWM, Social Entrepreneurship, and business case development

**UNIT III :Entrepreneurial System 9 hrs**

Search for business ideas, sources of idea, idea processing and selection. Input requirements; source and criteria of financing fixed and working capital, New venture management, corporate entrepreneurship, experimental learning of successful and unsuccessful entrepreneurs. Women Entrepreneur: Concept and functions of women entrepreneurs- Problems of women entrepreneurs- Developing women entrepreneurs. Case study & simulation exercise. Idea to implementation (tools and techniques), Government entrepreneurial programme (Aids /funding), incubation opportunities**.**

**UNIT IV :Entrepreneurship in Waste Management 9 hrs**

Scope and types of Entrepreneurship, Micro Resource Enterprise, Planning A Waste Managing Enterprise, Human Resources and Infrastructure, Arranging and Managing Finance, Managing a Waste Enterprise, Successful Experiences, Government rules and regulation regarding small industries, role of financial institution – IDBI, SIDBI, SFCs and commercial banks in assisting entrepreneurs, Other supporting institutions- District Industries Centers (DIC), Small Industries

Development Organization(SIDO), MSME-DI, Case study presentation. Innovations in waste management, value chain analysis, strategy development

**UNIT V :Business Models** **9 hrs**

Revenue models, different types, role of ICT in business models, ICT based business models, Role of IT Strategy in formulating business models for waste management. Value chain analysis – Strategic Development core competence; Marketing analysis of SWM; challenges in Entrepreneurship; scale – up opportunities

**TOTAL : 45 hrs**

**Reference Books:**


1. Vasant Desai, "Dynamics of Entrepreneurship Development", Himalaya Publishing House, 6th edition, 2011.
2. Charantinath, Poornima M., "Entrepreneurship Development and Small Business Enterprises", Pearson Publication, 2nd edition, 2013.
3. Drucker, Peter. "Innovation and Entrepreneurship". Harper Business; Reprint edition (9 May 2006)

**21GW27**
**PHYSICAL FITNESS THROUGH YOGA**

**0 0 2 1**

**Learning Objective(s):** To enable students to improve their mental and physical health.

| CO# | At the end of the course, the student should be able to | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recognize and apply the value and benefits of yoga practice | | | | | 3 | |
| CO2 | Improve physical and mental conditioning. | | | | | 3 | |

**Unit I:** **3 hrs**

Yoga –Purpose of of yoga -History of Yoga – types of Yoga – bhakthi yoga- karma yoga – raja yoga- Gnana Yoga- eight steps in Raja Yoga – what is Temple - physical health & mind

**Unit II:** **3 hrs**

Pranayama- pooraga- kumbhaka-rechaka-breating exercise and sudharchanakriya-varamakalai-varamakalai and pranayama – Division in Varmakalai

**Unit III:** **3 hrs**

Food – Food limit Yoga-Food habits – kinds of food with characters - Fasting – Types of Fasting –full Fasting – Partial Fasting – Fasting with Some Food- Special Treatments in Naturopathy –Banana leaf bath- mudbath- sunbath

**Unit IV:** **3 hrs**

Rejuvenating of Life Force –transformation into seven minerals - –Importance of Sexual Vital Fluid – Kayakalpa- importance of Kayakalpa – Live of siddhas (JeevanMukthi)-jeevan Samadhi places of Sanctity – mind – Frequency of Mind waves and Functions – stages of Mind's Functions – Three type of Consciousness – meditation

**Unit V:** **3 hrs**

Introduction of Asanas - General Benefits of Asana – Conducive conditions for asana Surya Namaskar- Types of Asnanas – standing postures – sitting postures –lying on stomach – lying on back – mudhars - Exercises for Hands and arms- Leg exercise- Breathing exercise – eye exercises – Kalapathy – Makarasanam- Massage- Acupressure- Relaxations

**TOTAL : 15 hrs**

**Reference books:**

1. Sarah Powers. Insight Yoga ,Shambala Publications , 2008.
2. Donna Farhi. Yoga Mind, Body & Spirit - A Return to Wholeness, Holt Paperbacks, 2000.

**21GW28**
**SOIL AND SOLID WASTE ANALYSIS LAB**

**0 0 2 1**

**Soil Analysis:** **15 hrs**

Soil sampling methods; Soil physical parameters: Soil texture, soil colour, Soil moisture , Bulk density and water holding capacity; Soil chemical properties: pH, water soluble solids, calcium and magnesium, chloride, Cation exchange capacity; Estimation of Organic matter and organic carbon; Estimation of Nutrients (Nitrogen, Phosphorus and Potassium); Determination of bio available and total available metals in soils

**Solid waste analysis:** **15 hrs**

Methods of Solid waste collection and characterization; Physicochemical analysis of solid waste (pH, Conductivity, Moisture content and bulk density; Ca, Mg, Na, K, Phosphate, total Nitrogen, Sulphate; Loss of ignition, Organic carbon, CN ratio; Heavy metals (only toxic metals)) ; Bio gas production from the waste in laboratory ( Estimation of methane, carbon di-oxide and total gas, Measurement of pH, total organic carbon and NPK before and after treatment ); Leachate collection and analysis

**TOTAL : 30 hrs**

# SEMESTER III

**21GW31**
**INTERNSHIP II**

**0 0 16 8**

**Course Requirements**

a) Students will have to undergo a summer internship for minimum eight to ten weeks in a company/firm/research organization at the end of Semester II.

b) All students placed for summer internship through campus placement process are mandated to attend the same and cannot change unless prior permission is taken.

c) Students will be assigned a faculty mentor for the entire period. Stage-wise approval as to the intended company, the start and finish dates and periodic reports has to be confirmed and completion certificates should be obtained and submitted to the mentor.

d) The internship assessment is a multi-stage sequential process.

e) At the end of the internship and in the beginning of the Semester III, students have to submit an internship report and make a presentation in which they will present their work to examiners from the industry and academia for evaluation.

A detailed guideline and instruction manual will be given to students at the end of Semester II.

**21GW32**

**HUMAN RESOURCE MANAGEMENT AND ORGANIZATIONAL DEVELOPMENT**

**3 0 0 3**

**Learning Objective(s):** To understand Human Resource Management and its contemporary issues the applicability of OD interventions.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recollect basic principles and concepts of human resource management | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | Outline the process of recruitment and selection | 3 | | | | 3 | |
| CO3 | State the fundamental principles of organization development | | | | 3 | 3 | |
| CO4 | Prescribe OD interventions for different situations | 3 | | | | 3 | |
| CO5 | Describe the process for implementing an intervention and identify barriers for successful implementation | | | | | 3 | |

**UNIT I :Introduction** **9 hrs**

Meaning of Human Resource Management, Evolution of HRM, Functions of HRM, Nature, Scope and significance of HRM, Changing environment and duties of HR Manager, HRM in Indian scenario. Motivation: Meaning, nature and importance of motivation, Theories of motivation – Maslow, Herzberg, McClelland, Alderfer, Vroom, Porter – Lawler, McGregor, Rewards – Monetary and Non – Monetary, Job design, job enrichment, job satisfaction, quality of work life, morale and productivity Human Resource Planning: Process of HRP, Assessing Human Resource requirements; Human resource forecasting; Work load analysis ; Job analysis-Job description and specifications; Job design; Job redesign- job enlargement, job rotation.

**UNIT II :Recruitment and Selection** **9 hrs**

HR planning, Job Analysis, Recruitment and Selection, Transfer and Promotion, An overview of Training and Development; process of recruitment- internal and external sources of recruitment Emerging trends in Recruitment, Selection- different types of selection tools to contemporary issues in HRM, and development, E-recruitment, and current trends in recruitment. Contemporary Issues in HRM: Employee compensation concept, factors affecting employee compensation, components of employee compensation, knowledge management, Human Resource Information System, issues of HRM in organizations

**UNIT III :Introduction to Organization Development** **9 hrs**

Concepts, Nature and Scope of O.D, Historical Perspective of O.D, Underlying Assumptions & Values Theory and Practice on change and changing, The Nature of Planned Change, The Nature of Client Systems : Group Dynamics, Intergroup, Dynamics and Organizations as Systems.

**UNIT IV :Interventions** **9 hrs**

Team Interventions, Inter-group Interventions, Personal, Interpersonal and group process interventions, Comprehensive interventions, Structural Interventions.

**UNIT V :Implementation and assessment of O.D** **9 hrs**

Implementation conditions for failure and success in O.D efforts, Assessment of O.D. and change in organizational performance, the impact of O.D. Some key considerations and Issues in O.D: Issues in consultant, Client relationship, the future of O.D, Some Indian experiences in O.D, Effect of OD interventions leading to organizational effectiveness.

**TOTAL : 45 hrs**

**Reference Books:**


1. Aswathappa .K, "Human Resource Management" ,8th Edition,New Delhi, Tata Mac Graw Hill, 2017
2. Bernadin ,"Human Resource Management" ,6th edition ,Tata Mcgraw Hill ,2012.
3. Gary Dessler, "Human Resource Management", 15th edition, Pearson Education Limited, 2016. ISBN 10: 0134304233 ISBN 13: 9780134304236
4. Thomas G. Cummings & Christopher G. Worley, "Organization Development and Change", 10th Edition, Cengage learning, USA, 2013
5. Dowling, P. J., Festing, M., & Engle A. D. Sr, "International Human Resource Management", 7th Edition, Cengage, India, 2017.

**21GW33**
**STRATEGIC MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To enable students to understand the basic concepts, principles and practices associated with business strategy formulation and implementation.

| CO# | At the end of the course, the student should be able to | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | State the basic principles and concepts of strategic management | 3 | 3 | 3 | | | 3 |
| CO2 | Formulate strategies for different business situations | 3 | 3 | | | 3 | |
| CO3 | Use strategic tools to analyse and reform business processes | 3 | 3 | | 3 | 3 | |
| CO4 | Evaluate strategic alternatives | 3 | 3 | | 3 | 3 | |
| CO5 | Recognise the factors for successful implementation of strategy | 3 | 3 | | | 3 | |

**UNIT I :Introduction to Strategic Management** **9 hrs**

Concepts of Strategic management, process and strategic decision making, defining business purpose, mission and objectives, strategic intent. Environmental Appraisal- external and internal and Industry analysis, corporate capabilities – SWOT analysis, concept of core competence and value chain analysis,(Case Studies for related topics), concept of competition, PESTEL Analysis, Industry analysis

**UNIT II :Formulation of Strategy** **9 hrs**

Level of strategy formulation, Generic competitive strategies: cost leadership, and differentiation, framework for analysing competition, competitive positioning of a firm, Game Theory approach to competitive dynamics, market entry.

**UNIT III :Strategic Tools** **9 hrs**

Business process reengineering, and Balance Score Card. Aggregate and granular metrics and metrics of value creation.

**UNIT IV :Strategic alternatives and Choices** **9 hrs**

Grand strategies, business level strategies, horizontal, vertical integration, diversification. Strategic Choices- BCG matrix, G.E matrix portfolio analysis - Technology based versus mature industries, External growth strategy – Strategic Alliances, merger-acquisition, collaborative partnerships.

**UNIT V :Implementation of Strategy** **9 hrs**

Elements of strategy implementation, structure, McKinsey's 7s framework Resources allocation, corporate leadership, personal values, organizational culture, Strategy evaluation and control. Strategic Issues of development organizations.

**TOTAL : 45 hrs**

**Reference Books:**


1. Max Mckeown, "The Strategy Book, Financial Times Publishing", latest edition, 2016
2. Porter .M.E. "Competitive Strategy: Techniques for Analyzing Industries and Competitors", New York: Free press, 2018
3. Thomas L. Wheelen, J. David Hunger, Alan N. Hoffman, Charles E. Bamford, PurvaKansal, "Strategic Management and Business Policy: Globalization, Innovation and Sustainability", Pearson Publication, 15th Edition, 2018.
4. David Fred and David Forest, "Strategic Management-Concepts and Cases", Pearson Education, 15th Edition, 2015.
5. Thompson, Peteraf, Gamble and Strickland, "Crafting & Executing Strategy: Concepts & Cases", McGraw Hill publication, 21st Edition, 2017.

**21GW34**

**REGULATORY FRAMEWORK- LEGAL ASPECTS AND MANDATORY REGULATIONS**

**3 0 0 3**

**Learning Objective(s):** To promote eco-responsible behaviour and practice compliance with regulatory requirements.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the institutions and the constitutional provisions made to protect the environment | 3 | 3 | 3 | 3 | | 3 |
| CO2 | Enumerate regulations for managing natural resources | 3 | 3 | | 3 | 3 | |
| CO3 | List regulations concerned with hazardous or biomedical waste | 3 | 3 | | 3 | 3 | |
| CO4 | Recollect regulations related to solid waste management | 3 | 3 | | 3 | 3 | |
| CO5 | Assess regulatory framework and effective implementation of regulations | 3 | 3 | | 3 | 3 | 3 |

**UNIT I : Constitutional provisions for the protection of Environment** **9 hrs**

Fundamental Rights and Fundamental Duties, Directive Principles of State Policy and other Constitutional mandates, Public Interest Litigation and Doctrine of Trust, National Green Tribunal, The Ministry of Environment, Forest and Climate Change, role of CPCB / SPCB; Supreme Court & High Courts case laws discuss for Constitutional Objectives &Environmental Jurisprudence

**UNIT II : Regulation for Natural Resource Management** **9 hrs**

Framework for Established Industries :Consent for Establishment (CFE), Consent for Operations (CFO), Environment Public Hearing, Forest & Wildlife Protection Laws, Air and Water Pollution Control Laws, Factories Act 1948, Motor Vehicles Act 1988, Public Liability Insurance Act 1991, The Environment Protection Act 1986

**UNIT III : Legal Framework for Hazardous and Biomedical Waste Management** **9 hrs**

The Hazardous Waste Management Rules, Biomedical Wastes (Management and Handling) Rules 2016 & 2018, E-waste (Management and Handling) Rules 2018, The Batteries (Management and Handling) Rules 2001

**UNIT IV :Legal Aspects for Solid Waste Management** **9 hrs**

Municipal Solid Waste Management Rules 2016,Plastic Waste Management Rules 2018, The Construction and Demolition Waste Management Rules 2016, EPR- Extended Producer Responsibility, Cleaner Production Option and Waste Management ; Indian legislation; recycling opportunities; reuse of e- waste; Plastic Waste Management Rules amended in 2018

**UNIT V :National and International Instruments** **9 hrs**

International Instruments, Corporate Social Responsibility, International Conventions, An assessment of the legal and regulatory framework in India; Assessment of actual /ground implementation of Rules must be undertaken to find out solutions for better Legal & Regulatory frameworks

**TOTAL : 45 hrs**

**Reference Books:**


1. Armin Rosencranz and Shyam Divan. "Environmental Law and Policy in India: Cases, Materials, and Statutes", Oxford, 2012
2. P. Leela Krishnan, "Environmental Law in India", LEXIS- NEXIS, 5th edition, 2019.
3. Justice T S Doabia. "Environmental and Pollution Laws In India", LEXIS- NEXIS, 3rd edition, 2017.
4. StuantBell,DonaldMcGillivary, Ole Pedenson, "Environmental Law", Oxford University Press, 2012
5. VibhavNavneet,"Environmental Law- An introduction". LEXIS – NEXIS, 1st edition, 2016.

**21GW35**

**HEALTH, FITNESS AND NUTRITION FOR MANAGERS**

**0 0 2 1**

Learning Objective(s): To apply fundamentals of physiology and nutrition in promoting a healthy lifestyle.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Explain the various kinds of diseases affecting human beings | | | | | 3 | |
| CO2 | Explain and follow a healthy lifestyle with right nutrition | | | | | 3 | |
| CO3 | Develop and follow a proper fitness regimen | | | | | 3 | |

**UNIT I : Communicable diseases and non-communicable diseases** **10 hrs**

Dimensions of health, determinants of health, agent factors, host factors, environmental factors, modes of transmission, prevention of communicable diseases

Risk factors and prevention of obesity, hypertension, diabetes, coronary heart disease, stroke, cancer, accidents

**UNIT II : Healthy practices and nutrition** **10 hrs**

Personal hygiene, proper disposal of solid waste, first aid, stress management, sleep, informing other team members to be healthy

Balanced diet, nutritional requirements, nutritional content of foods, nutritional factors in selected diseases like cardiovascular disease, diabetes, cancer, obesity

**UNIT III: Physical fitness** **10 hrs**

Role of physical fitness in maintenance of good health and avoidance of diseases, Types and duration of physical activity, assessment of fitness level, creating a daily workout routine

**TOTAL 30 hours**

**Reference Books:**


1. Park K. Park's Textbook of "Preventive and Social Medicine", M/s BanarsidasBhanot Publishers, 24th edition, 2017.
2. World Health Organization, (2015), Factsheet No. 394 Available from : http://www.who.int/mediacentre/factsheets/fs394/en/ (accessed on 07-02-2018)
3. World Health Organization, "Global recommendations on physical activity for health", 2010.

**21GW36**
**DESIGN THINKING**

**0 0 2 1**

**Learning Objective(s):** To apply design thinking to business decision making.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall design thinking concepts and principles | 3 | | | | | |
| CO2 | Practice the methods, processes and tools of design thinking | 3 | | | | | |
| CO3 | Integrate the design thinking process in everyday life and use it as an instrument for innovation | 3 | 3 | | | | 2 |

**UNIT I : Introduction to Design Thinking** **10 hrs**

Types of thinking – Analytical, Intuitive, Deduction, Induction, Abduction; Definitions of Design Thinking, Principles and elements of Design Thinking, Human centric approach, Understanding the business hypothesis, customer perspective, inspiration, visualization through storyboarding etc.

**UNIT II : Design Thinking Process** **10 hrs**

Defining the problem, Data Collection, Observation techniques, gaining insights, Ideation, concept development, Experimentation, prototyping principles, Prototyping, Testing, Assumptions Identification

**UNIT III: Design Thinking for Innovation** **10 hrs**

Design Thinking in organisations, how to diffuse Design Thinking into work culture, Using Design Thinking to innovate in business, Disruptive innovation

**TOTAL 30 hours**

**Reference Books:**


1. Tim Brown, "Change by Design, Revised and Updated: How Design Thinking Transforms Organizations and Inspires Innovation", Harper Business, 5th Edition, 2019.
2. Kelley, Tom, and Littman, Jonathan, "The Art of Innovation : Lessons in Creativity from IDEO", America's Leading Design Firm Profile Books Ltd, 2015
3. Ling, Daniel,"Complete Design Thinking Guide for Successful Professionals", Emerge Creative Groups LLP, 2015
4. Kahneman, Daniel, "Thinking, Fast and Slow", 1st Edition, Penguin, 2012.
5. Jeanne Liedtka, "Solving Problems with Design Thinking – Ten Stories of What Works", 1st Edition, Columbia University Press, 2013.

**21GW37**
**ENERGY AND SIMULATION LAB**

**0 0 4 2**

**Energy Engineering** **30 hrs**

Performance evaluation of solar thermal system, Performance evaluation study of biomass digester/gasifier, Energy consumption and lumen measurement of lights and ballasts, Power quality measurements of electrical power systems, Performance evaluation of wind energy systems, Aerodynamic performance study of bluff and streamlined bodies.

**Computational Fluid Dynamics** **30 hrs**

Flow simulation - Internal flow – Laminar region, Flow simulation - External flow – Laminar region, Flow simulation - Internal flow – Turbulence region, Flow simulation - External flow – Turbulence region, Flow simulation - Internal flow with heat transfer, Flow simulation - External flow with heat transfer.

**TOTAL : 60 hrs**

## AUDIT COURSE

| 21GW38 | UNIVERSAL HUMAN VALUES | 2 0 0 0 |
|---|---|---|

| UNIT 1: INTRODUCTION TO VALUE EDUCATION | 6 Hours |
|---|---|
| Understanding Value Education - Self-exploration as the Process for Value Education, Sharing about Oneself - Continuous Happiness and Prosperity – The Basic Human Aspirations -Right Understanding, Relationship and Physical Facility, Exploring Human Consciousness - Happiness and Prosperity – Current Scenario - Method to fulfil the Basic Human Aspirations, Exploring Natural Acceptance | |
| **UNIT 2: HARMONY IN THE HUMAN BEING** | **6 Hours** |
| Understanding Human Being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - The Body as an Instrument of the Self - Harmony of the Self with the Body - Programme to ensure self-regulation and Health | |
| **UNIT 3: HARMONY IN THE FAMILY AND SOCIETY** | **6 Hours** |
| Harmony in the Family – the Basic Unit of Human Interaction - Values in Human-to-Human Relationship - 'Trust' – the Foundational Value in Relationship - 'Respect' – as the Right Evaluation - Understanding Harmony in the Society - Vision for the Universal Human Order | |
| **UNIT 4: HARMONY IN THE NATURE/EXISTENCE** | **6 Hours** |
| Understanding Harmony in the Nature - Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature - Realizing Existence as Co-existence at all Levels - The Holistic Perception of Harmony in Existence | |
| **UNIT 5: IMPLICATIONS OF THE HOLISTIC UNDERSTANDING – A LOOK AT PROFESSIONAL ETHICS** | **6 Hours** |
| Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct - A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order - Professional Ethics and Right Understanding - Competence in Professional Ethics - Strategies for Transition towards Value-based Life and Profession | |
| **Total** | **30 Hours** |

**Reference Books:**


1. R R Gaur, R Asthana, G P Bagaria, “A Foundation Course in Human Values and Professional Ethics”, Excel Books, New Delhi, 2nd Revised Edition, 2019.
2. R. S. Naagarazan, "A text book on Professional Ethics and Human Values", New Age International Ltd, 2020.
3. Tanu Shukla, AnupamYadav, Gajendra Singh Chauhan, “Human Values and Professional Ethics, Cengage India Private Limited, 1st Edition, 2017.
4. Jayshree Suresh and B. S. Raghavan, “Human Values and Professional Ethics: Values and Ethics of Profession” S. Chand Publishing, 4th Edition 2012.

# SEMESTER IV

**21GW41**
**INTERNSHIP III**

**0 0 8 4**

Students are to undergo a field immersion experiential internship spanning 120 hours over the semester III. They are to submit field visit learning reports and submit a comprehensive report at the end of the semester. Students will be allotted a faculty guide to keep track of the same and evaluate the learning progress through the semester. At the end of the semester, there will be a comprehensive evaluation based on the report and a viva voce conducted by a suitable evaluation committee appointed by the HoD

**21GW42**

**Information and Communication Technology & Management Information Systems**

**3 0 0 3**

**Learning Objective(s):** To create awareness about different types of information systems in an organization so as to enable effective decision making.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in Information and Communications Technology | | 3 | | 3 | | 3 |
| CO2 | Enumerate the components and types of Information Systems | | | | 3 | | |
| CO3 | Appreciate and uses Information Systems in operations and decision making | | 3 | | 3 | | |
| CO4 | Utilise information resources and technology | 3 | 3 | | 3 | 3 | |
| CO5 | Identify and assess security and ethical challenges with respect to information systems | | 3 | 3 | | 3 | 3 |

**UNIT I : ICTs** **9 hrs**

Concept, Principles, and Scope of ICT in Rural Development, Introduction to IS, Technology and modern enterprise, Introduction to Computers, Computer Generations, Operating systems, Browsers: Google Chrome, Internet Explorer, Microsoft Office: MS Word, MS PowerPoint, MS Excel and MS-Project. Use of e-mail, Facebook, twitter and WhatsApp. Developing multi-media content and communication systems (DVD, CD, tele/video conferencing), ICT Applications in e-agriculture, e-awareness generation, e-banking, e-commerce, e-development, e- education, e-empowerment, e-entertainment, e-governance, e-health (human & veterinary), e-insurance, e-marketing, Applications of Local Area Portal (LAP) Software, Digital imaging and GIS mapping

**UNIT II :Foundations of Information Systems** **9 hrs**

A framework for business users - Roles of Information systems - System concepts - Organization as a system - Components of Information Systems - IS Activities; Types of IS. Strategy and technology, internet and telecommunications, e-commerce technologies

**UNIT III :IS for operations and decision making** **9 hrs**

Marketing IS, Manufacturing IS, Human Resource IS, Accounting IS and Financial IS - Transaction Processing Systems- Information Reporting System - Information for Strategic Advantage, internet marketing, web 2.0, SEO

**UNIT IV :Managing Information Technology** **9 hrs**

Managing Information Resources and technologies – IS architecture and management - Centralised, Decentralised and Distributed - EDI, Supply chain management & Global Information technology Management, Business process reengineering, BPM

**UNIT V :Security and Ethical Challenges** **9 hrs**

IS controls - facility control and procedural control - Risks to online operations - Ethics for IS professional - Societal challenges of Information technology, data, warehouse, and BT. Enterprise architecture, mobile computing, ethics.

**TOTAL : 45 hrs**

**Reference Books:**


1. Ramesh Bhel, James A.O'Brien, George M.Marakas, "Management Information Systems", McGraw Hill Eduction, 11th Edition, 2019.
2. Jaytilak Biswas, "Management Information Systems", Sage Publications India, 2020.
3. Oz, E. "Management Information Systems", 2nd Edition, Cengage Learning, 2008
4. Kenneth C.Laudon, Jane P.Laudon, Management Information Systems – Managing the Digital Firm, 14th Edition, 2017.
5. Haag, S., Cummings,M., and Phillips, A. Management Information Systems. (6th edn.), Tata McGraw Hill: India. 2008

**21GW43**

**WASTE MANAGEMENT AS PROJECT MANAGEMENT AND GEOGRAPHIC INFORMAITON SYSTEM**

**3 0 0 3**

**Learning Objective(s):** To comprehend the special characteristics and problems in waste management and to apply the various steps of project management where appropriate.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in project management | 3 | 3 | | 3 | | 3 |
| CO2 | Enumerate the steps in starting a project | 3 | | | | | |
| CO3 | Make feasibility studies and execute projects | 3 | 3 | | 3 | 3 | |
| CO4 | Monitor a waste-based project with emphasis on quality | 3 | | | | 3 | 3 |
| CO5 | Close out a project and perform auditing and follow-up | 3 | | | | 3 | |

**UNIT I :Projects in Contemporary Organizations** **9 hrs**

Introduction to Project Management, Meaning of a project, relevance of project management principles for waste management. Project vs. operations, Roles and Responsibilities of Project Manager, Benefits of project management, Project lifecycle. Introduction of GIS and Remote Sensing in waste management applications. Familiarisation with ArcGIS, and open source software QGIS, Factors influencing waste disposal site, soil, water bodies, population density, scope, drainage, road.

**UNIT II :Project Selection Techniques** **9 hrs**

Beginning a project, Project Selection, Defining criteria, Project selection methods, Scope Definition, Project Charter development, Work break down structures, Project resources and scheduling, building a project schedule. Project Planning Tools (Bar charts, Logical Frame work approach, CPM, and PERT)

**UNIT III :Project Development** **9 hrs**

Project Execution, Monitoring through Information Systems, Project control, scope creep, Capital Cost Estimating, Monitoring Techniques and time control System, Project Cost Control and Time cost Trade-off, Project Procurement and Materials Management, Pre-Feasibility Study, Feasibility Studies, Project Break-even point.

**UNIT IV :Monitoring a Waste-based Project** **9 hrs**

Conflict Resolution, Team Management and Diversity Management, Change management, Quality, Quality Concepts, Risk Management- Risk identification, Qualitative risk analysis, Quantitative risk analysis, Risk planning, Risk control, Use of MS-Project Software for Project Planning and Monitoring, GIS

**UNIT V :Project completion** **9 hrs**

Project Close-out, Steps for Closing the Project, Project Termination, Project Follow-up, Project auditing, Case Studies for all the above Modules, should be incorporated as per the current requirements of the course.

**TOTAL : 45 hrs**

**Reference Books:**


1. Passenheim Olaf, "Project management". Ventus Publishing ApS. latestedn, 2009.
2. Robert K Wyoski, "Effective Project Management" , Wiley Int, 2016 ISBN: 1118729168
3. Greg Horeine, "Project Management", 2017

**21GW44**
**CREATIVITY AND INNOVATION**

**3 0 0 3**

**Learning Objective(s):** To enhance creative potential by strengthening various mental abilities and understanding ways of harnessing it for organizational excellence.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the different types of thinking and when they are used | | 3 | | 3 | | 3 |
| CO2 | Describe the factors that enhance general creativity | | | | | | 3 |
| CO3 | Explore opportunities for creativity in businesses | 3 | 3 | | | 3 | 3 |
| CO4 | Design conditions to promote creativity at work | | | | 3 | 3 | 3 |
| CO5 | Identify and assess favourable conditions for innovation in business | 3 | 3 | | | 3 | 3 |

**UNIT I :Realms of Creativity** **9 hrs**

Creativity-Concept-Convergent and Divergent Thinking-Creativity Intelligence-Enhancing Creativity Intelligence-Determinants of Creativity-Creativity Process-Roots of Human Creativity-Biological, Mental, Spiritual and Social-Forms of Creativity-Essence, Elaborative and Expressive- Existential, Entrepreneurial and Exponential.

**UNIT II :Creative Personality** **9 hrs**

Traits Congenial to Creativity- Motivation and Creativity-Strategies for changing Motivation-Creative Environment- Formative Environment and Creativity- Adult Environment- Environmental Stimulants-Blocks to Creativity-Strategies for unblocking Creativity.

**UNIT III :Managerial Creativity** **9 hrs**

Creative Manager-Techniques of Creative Problem Solving- Creative Encounters and Creative Teams-Perpetual Creative Organizations-Creative Management Practices- Human Resource Management, Marketing Management, Management of Operations, Management of Product Design and Growth Strategies.

**UNIT IV :Management of Creativity** **9 hrs**

Issues and Approaches to the Design of Creative Organizations-Policy frameworks-Organizational Design for Sustained Creativity-Mechanism stimulating Organizational Creativity-Creative Diagnosing-Creative Societies-Necessity-Model of a Creative Society.

**UNIT V :Innovation** **9 hrs**

Nature of Innovation-Technological Innovations and their Management-Inter- Organizational and Network Innovations- Design of a Successful Innovative Organization-Training for Innovation-Management of Innovation-Agents of Innovation- Skills for Sponsoring Innovation.

**TOTAL : 45 hrs**

**Reference Books:**


1. Margaret, A. White & Gary D. Bruton, "The Management of Technology Innovation- A Strategic Approach", Cengage Learning, latest edition, 2010.
2. Praveen Gupta, "Business Innovations in the 21st Century", S.Chand, 2008.
3. CSG KrishnamaCharyulu&R.Lalitha- Innovation Management, Himalaya Publishing House, latest edition, 2013

**21GW45**
**MANAGING CONTRACTS**

**0 0 2 1**

**Learning Objective**:To expose students to the use of contracts in business context

| COURSE OUTCOMES | At the end of the course, the student should be able to, | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Explain the fundamental concepts related to contracts and different types of contracts | 3 | | | 3 | | |
| CO2 | Know how and when to use special contracts | 3 | | | 3 | | |
| CO3 | Draw up a business contract and identify consequences of breaching contracts | 3 | | 3 | 3 | | 3 |

**UNIT I : Basics of Contracts** **10 hrs**

Agreement vs contract-Communication-acceptance-revocation- consideration-express and implied promises-voidable, void, illegal, unenforceable contracts-fraud vs undue influence-mistakes by one party

Express contract-Implied contract-quasi contract-bilateral contract- unilateral contract-contingent contracts-compulsory contracts

**UNIT II : Indemnity, guarantee, Bailment** **10 hrs**

Pledge and Agency - Rights of indemnity holder-guarantee components-various cases in guarantee-bailor and bailee-various cases in bailment-pawner and pawnee-agent and principal-sub agent-revocation and termination- rights of agent

**UNIT III : Drawing up a contract** **10 hrs**

Purchase and sales contract-employment contracts-Service contracts-Lease contracts-Outsourcing contracts-non disclosure contracts-non competing contracts

Rescinding contract-compulsory execution-penalty for damages- initiating legal process as remedy

**TOTAL : 30 hrs**

**Reference Books:**


1. Bangia, R K,"Indian Contract Act", 14th Ed, Allahabad Law Agency, 2015.
2. Rajkumar, C A,Adukia, S ,"Drafting commercial contracts and agreements", 1st Ed, Aisa Law House, 2012
3. Nabhi's Board of Editors,"Legal Drafting for Layman", Nabhi Publications, 1 st edition, 2014.
4. Saha, TusharKanti , "Law of contract: Theories and Principles", 1st Nexis Ed, Universal Law Publishing-an imprint of Lexis , 2016
5. Kumar, H L, "Legal Drafting: Do it yourself", Universal Law Publishing-an imprint of Lexis Nexis, 4th edition, 2016.

**21GW46**

**THROUGHPUT ACCOUNTING AND THEORY OF CONSTRAINTS**

**0 0 2 1**

**Learning Objective(s):** To enable students to use the concepts of throughput accounting and theory of constraints in an organisational setting.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in theory of constraints | 3 | | | | | 3 |
| CO2 | Solve problems related to throughput accounting | 3 | 3 | | 3 | 3 | 3 |
| CO4 | Develop well defined strategies using strategy and tactic trees | 3 | 3 | | | 3 | 3 |

**UNIT I :Introduction to TOC** **10 hrs**

Theory of constraints-History of productivity–- Philosophies of TOC- -Goal of an organization-Appreciation of variability and dependency. Pillars (Inherent simplicity, Goodness of people, no conflict existence). Five focusing steps- Type of Constraints. Methods of TOC-An overview - TOC Measurements on Productivity-Throughput, Operating Expenses, Inventory.

**UNIT II :Throughput Accounting** **10 hrs**

Throughput accounting (TA)- Fundamental difference between TA -Cost accounting- Lean accounting-Cost world vs throughput world- Decision making based on exposed capacity. Ratios of TA – Throughput-margin per unit, Throughput-margin per unit time on constrained resource, Productivity (TA) ratio, T/I, delta_T/delta_OE, ROI. Decision making on Product mix problems. Throughput Dollar days and Inventory Dollar days.

**UNIT III :TOC Thinking Process** **10 hrs**

Thinking process-Logically and clearly- Change and improvements-Six layers of resistance-Verbalizing the problems-Dettmer's categories of legitimate reservations- Destination: Goal tree- Strategy and tactic tree. Analysis and possible solution: Logical tree diagrams- Current Reality Tree, Evaporating cloud, Future Reality Tree. Execution of change: Prerequisite trees. Transition and progress: Action tree diagram-Network chart-Gantt chart-Fever chart.

**TOTAL : 30 hrs**

**Reference Books:**


1. Dettmer, H. W. The logical thinking process. A Systems Approach to Complex Problem Solving. American Society for Quality, 2007
2. Sekkizhar, J. Throughput accounting: Numerical solutions from theory of constraints, KDP publishing, 2020
3. Bragg, S. M. Throughput accounting: a guide to constraint management. John Wiley & Sons. 2012
4. Goldratt, E. M. The Goal, The process of ongoing improvement, Productivity press India Ltd., Edition 3, 2016.

**21GW47**
**ORGANIC WASTE MANAGEMENT LAB**

**0 0 4 2**

**Organic Waste Management:**

Waste auditing: Sampling, auditing, segregation; Waste Characterization: Physico-chemical and Biological analysis, Proximate and Ultimate analysis; Mini-Project: Composting: Setting up of composting, monitoring parameters, evaluation of composting; Mini-project: Anaerobic digestion: Setting up of the reaction, monitoring and evaluation of the gas evolved

**TOTAL : 60 hrs**

# ELECTIVES

**21GWA1**
**OPERATIONS AND MAINTENANCE**

**3 0 0 3**

**Learning Objective(s):** To understand about operations in waste management methods and techniques and to address environmental hygiene and safety.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recollect waste management methods and techniques | 3 | 3 | | 3 | | 3 |
| CO2 | Maintain plant operations and manage contingencies | 3 | | | | 3 | |
| CO3 | Organise collection and storage of solid waste | 3 | | | | | |
| CO4 | Monitor and regulate daily operations of solid waste management | 3 | | | | | |
| CO5 | Utilise software tools for monitoring and control | 3 | 3 | | | 3 | |

**UNIT I :Waste Management methods and techniques** **9 hrs**

Waste Management methods and techniques, government priorities, local involvement, Management of Collectives, NGOs, political will, community mobilization, resolving bottle necks, addressing environmental hygiene and safety

**UNIT II :Operation and maintenance** **9 hrs**

Operation and maintenance – importance, Monitoring plant operation in the central control room, actively employing local residents, Conducting a daily equipment inspection, Waste crane operation, Loading bulky waste, Operations Management/Maintenance manuals/plans, and Environmental Health and Safety Contingency Plans, Facility/System day-to-day operations protocol /procedures, Site and equipment maintenance schedule / regime, Staff/operator training in facility operations, & environmental health and safety, Record keeping and Reporting

**UNIT III :Waste Collection & Transport** **9 hrs**

Collection & storage of Municipal solid waste, Methods of collection – House to House collection, Community bins, Collection routes, Manpower requirement on- site storage methods, transfer station, transportation methods, mechanical methods – with or without compaction, economy in transportation, waste optimization of transport routes, Replacing, repairing, track recording of vehicles, machinery

**UNIT IV :Daily operations** **9 hrs**

Daily operations including recording and reporting data, maintenance data, operational record data, Access Control and Hours of Operation, Regulation of Scavenging, Burning for Volume Reduction, Landfill Operation, Control of Windblown Debris, Control of Fire, Release to the Receiving Environment, Troubleshooting and Resolving Safety, Service, and Operational Issues Maintain and distribute department related information on a daily basis. Predictive Maintenance- Waste management equipments, life cycles, capacity, labor effort cost, predictive methods

**UNIT V :Usage of tools** **9 hrs**

Usage of software tools to manage a variety of tasks, such as procurement, time and attendance, safety incidents, contract labour, Data collection and reporting required for incentive pay programs, processing of payments and other financial tasks as necessary, implementation of operational projects, employees scheduling and work assignments, Facility Maintenance & Renovation, Inspection and Monitoring, Odour Management Program, Vector (rodents, flies, other) Control Programs, siting, design, construction, operation, and decommissioning of waste management facilities, reduce and mitigate adverse environmental impacts associated with management of waste material; Predictive Maintenance- pro-data science and information age

**TOTAL : 45 hrs**

**Reference Books:**


1. Central Pollution Control Board, "Municipal Solid Wastes Processing Technologies: Reference Manual for Local Bodies", New Delhi, 2002.
2. Govt of India, "Salient Features of Solid Waste Management Rules 2016", New Delhi, 2016.
3. Ministry of Urban Development, Govt of India , "Municipal Solid Waste Management Manual", New Delhi, 2016.
4. Central Pollution Control Board, "National Action Plan for Municipal Solid Waste Management", New Delhi, 2015.

**21GWA2**

**ENVIRONMENT IMPACT ASSESSMENT**

**3 0 0 3**

**Learning Objective(s):** To provide insights in to conduct of waste audit and environment impact assessment and application.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the objectives and scope Environmental Impact Assessment | | 3 | | | | 3 |
| CO2 | Develop impact predictions and mitigation measures | 3 | | | | 3 | |
| CO3 | Create strategic assessments and environmental management plans | 3 | 3 | | | 3 | |
| CO4 | Conduct waste audits according to international standards | 3 | | | | 3 | |
| CO5 | Recollect about conventions pertaining to waste management and their outcomes | 3 | 3 | 3 | | | |

**UNIT I : Introduction** **9 hrs**

Definition, Background, Objectives, Scope of EIA, Policies, Legal and Institutional framework, Guidelines EIA for Waste Management, checklists for Impact Assessment in Waste Management; Social Impact Assessment

**UNIT II :Fundamentals of EIA** **9 hrs**

Fundamentals of EIA, Steps in EIA, Predication of Impacts, Evaluation, Mitigation measures, Public Hearing, EIA Report, Monitoring Audits, Assessment Methodology, Identification of Potential Sources of Impact, Costs of EIA; Social Perspective

**UNIT III :Environmental Assessment** **9 hrs**

Strategic Environmental Assessment (SEA), EIA in India, Environmental Management Plan (EMP), Applications of EIA specific to this course – to site dump yards and landfill areas

**UNIT IV :Waste Audit** **9 hrs**

Introduction, Definition, Objectives of Audit,Steps in Waste Audit, Management through Environmental Audit: ISO 14000, 14001; Quality of the implementation process, Environmental Management benefits Implementing Certification Maintaining your ISO 14001, ISO 9000:2015 Principles of Quality Management

**UNIT V :International Agreements on Waste** **9 hrs**

MARPOL Convention, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Joint Convention, Convention on Nuclear Safety, National Waste Management Systems

**TOTAL : 45 hrs**

**References Books:**


1. Dr. R. R. Barthwal, “Environmental Impact Assessment”, New age International Pvt. Ltd, 2nd Edition, 2018
2. Dr. R.K. Kitoliya, “Environmental Impact Assessment and Management”, Discovery Publishing house, Edition 2017.

**21GWA3**
**ENVIRONMENT ECONOMICS**

**3 0 0 3**

**Learning Objective(s):** To calculate, study and report the socio-economics of neglecting waste management and environmental hygiene, and its cost to human health, the environment and the economy.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Understand and list the ecological impacts of not managing waste | 3 | | | | | |
| CO2 | Enumerate the impacts of non-management of wastes on human life | 3 | 3 | | | 3 | |
| CO3 | Appreciate the social costs of not managing waste | 3 | 3 | | | 3 | |
| CO4 | Compute the economic impact of non-management or improper management of wastes | 3 | 3 | | | 3 | |
| CO5 | Design products and product life cycles which protect the environment | | | 3 | | 3 | 3 |

**UNIT I :Ecological Costs of Non-Management of Waste** **9 hrs**

Overview, Eco-economics, Valuation Techniques, Obsolescence - Strategies for improved durability of products, Ecological Cost – benefits, Ecological Cost of Waste Production, Pollution – types, threats to life forms, Activities that threaten biodiversity; remedies and solutions, waste of monoculture in farming – effect of burning rice straw instead of using it as fodder for cattle; pesticide waste residues; Strategies for ecological balance & maintenance; Remedial measures

**UNIT II :Human Cost of Not Managing Waste** **9 hrs**

Introduction to Human Cost techniques for assessment; consequences of non-0management;Holistic meaning of Human Development, Measuring the burden of disease- DALY and QALY, Occupational and Environmental Health Hazards for Waste pickers, Vulnerability of citizens, Strategies for eliminating such costs, remedies and solutions

**UNIT III :Social costs** **9 hrs**

Introduction to social costs; Vulnerability, Most vulnerable people in pyramid; Human Development Costs, Littering costs, Plastic world – suffocating living beings, micro-plastics spread all over, Major Threats to Sustainability; Cultural & Ethical Costs with case studies; Strategies for eliminating social costs

**UNIT IV :Economic Cost of Improper Waste Management** **9 hrs**

Waste – to be contained at Source, Consumerism& it's effects, Efficiency of Resource Use-Production and Consumption, Environmental Taxes, Life Cycle Assessment, Cost- Benefit Analyses, economic comparison of waste storage and source management; costs of eliminating waste through

small closed loop cycles; economic comparison of waste storage & source management; Economic & Business consequences in case of non-management

**UNIT V :Product Stewardship** **9 hrs**

Product Stewardship, Product Stewardship Act, Product Stewardship vs Extended Producer Responsibility, Voluntary product stewardship, Businesses and Product Stewardship, Consumers and Product Stewardship, Principles of Responsible Product Stewardship

**TOTAL : 45 hrs**

**Reference Books:**


1. Pichtel, John, "Waste Management Practices", CRC Press, 2014
2. SunitaNarain& Swati Singh Sambyal, "Not in My Backyard- Solid Waste Management in Indian Cities", Centre for Science and Environment, 2018.

**21GWA4**

**HOTEL WASTE MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To understand the types of hotel waste produced, ways to handle them and how to conduct waste audit in hotels.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the significance of hotel waste management | 3 | | | | | |
| CO2 | Distinguish between the different types of hotel waste | 3 | 3 | | 3 | | |
| CO3 | Organise waste management programs at hotels | 3 | | 3 | 3 | 3 | 3 |
| CO4 | Devise a food waste management strategy for hotels | 3 | 3 | 3 | | 3 | 3 |
| CO5 | Conduct audit of hotel wastes | 3 | | 3 | | 3 | 3 |

**UNIT I :Introduction** **9 hrs**

Importance of Hotel Waste Management, Objectives, actions needed on Waste Management, monitoring, designing the recovery system

**UNIT II :Overview of Hotel Waste** **9 hrs**

Overview of Hotel Waste, Types of Waste in Hotels, Steps of Effective Waste Management in Hotels, Benefits of Waste Reduction, Recognize role at different levels to manage waste, Importance of allocating budget for managing waste

**UNIT III :Waste Management Program** **9 hrs**

Organizing a Waste Management Program, Purchase Recycled Content Products

**UNIT IV :Food Waste Management Strategy** **9 hrs**

Food Waste Management Strategy, Waste Types by Department/Activity in hotels, Staff Training & Communication

**UNIT V :Audit** **9 hrs**

Auditing of Waste in Hotels, Performing Waste Audit, Tools to Conduct Waste Audit, Restaurant Food Waste Reduction Ideas

**TOTAL : 45 hrs**

**Reference Books:**


1. International Tourism Partnership (ITP) presents "Green Hotelier – Know How Guide to Reducing and Managing Food Waste in Hotels", September 2014
2. Jennifer Raga, "Environmental Management for Hotels: A Comprehensive Guide for Sustainable Operation", Society Publishing , 2018
3. Claire Baker, Scott Mycock, "Environmental Management For Hotels: The Industry Guide To Sustainable Operation", International Tourism Partnership, Digital Release 2014

**21GWA5**

**RECLAMATION, REMEDIATION AND CAPPING**

**3 0 0 3**

**Learning Objective(s):** To assess contamination and be aware of waste management technologies on reclamation, soil remediation and MCDA.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Assess and analyse contamination prior to remediation | 3 | 3 | | 3 | | |
| CO2 | List waste management technologies and understand when they are suitable | 3 | | | | 3 | 3 |
| CO3 | Develop landfill reclamation projects | 3 | | | | 3 | 3 |
| CO4 | Organise soil, water and air remediation | 3 | | | | 3 | 3 |
| CO5 | Perform multi-criteria decision analysis to generate alternatives for waste management | 3 | 3 | | 3 | | |

**UNIT I :Assessment of contamination before reclamation and remediation 9 hrs**

Characterization of contamination and assessment of exposure, risk and resilience, Sample collection and analytical methods, Factors influencing risk assessment of contaminated site, Assessing exposure, risk and resilience

**UNIT II :Waste Management Technologies 9 hrs**Eco Friendly Waste Management Technologies, Reclamation, Overview of Bioremediation Technologies; Microbial Bio-remediation &Myco-remediation; Phytoremediation; Introduction to Phytoremediation, Plant processes, Different phytoremediation methods, Phytoremediation - Design considerations, microbial bioremediation and myco remediation

**UNIT III :Landfill Reclamation 9 hrs**Landfill reclamation projects, Waste Lands-Classification and Reclamation, Use of waste as Filling, Material in Land Reclamation, Criteria Approach, and Implementation analysis – Land reclamation, Implementation of Land Reclamation Sample Check-Points, Land Reclamation – Scenario Development

**UNIT IV :Bio Remediation 9 hrs**Soil resources and bioremediation, Soil Restoration and Night Soil Management, Soil remediation technologies, Classification of Soil Remediation Technologies, Bio-mining, Capping, Gas Recovery, Power Generation and Landfills, Remediation of water and air.

**UNIT V :Multi-Criteria Decision Analysis (MCDA) 9 hrs**Multi-Criteria Decision Analysis or Multi-Criteria Decision Making (MCDM), Methodological process and criteria options, Identification and implementation of waste options/alternatives

**TOTAL : 45 hrs**

**Reference Books:**


1. C. Paul. Nathanail, "Reclamaton of Contaminated Lands", Wiley Publications, 1st edition, 2008
2. Singh SN, Tripathi RD, "Environmental bioremediation technologies", Springer-Verlag Berlin Heidelberg., 2007

**21GWA6**
**SANITATION AND HYGIENE**

**3 0 0 3**

**Learning Objective(s):** To gain a basic understanding of sanitation and hygiene, faecal sludge treatment and construction of sanitation facility.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in sanitation and hygiene | | 3 | | 3 | 3 | 3 |
| CO2 | Outline features of toilets and their modifications for different situations | | | | | | 3 |
| CO3 | Appreciate and devise methods for faecal sludge treatment | | 3 | | | | 3 |
| CO4 | Design sanitation infrastructure based on available resources | 3 | | 3 | | 3 | 3 |
| CO5 | Promote community sanitation | | | 3 | | | 3 |

**UNIT I :Sanitation and Hygiene** **9 hrs**
Sanitation and Hygiene – definitions, scope, importance, its link with health, relation with economic development, specific areas to focus, effects of poor sanitation, Sanitation ladder – sanitation technologies

**UNIT II :Toilets** **9 hrs**
Proportion and Number of toilets, Gender sensitive sanitation facilities, Ramps for differently abled, Types–Indian, Western; Latest technologies in Toilet infrastructure with emphasis on feasibility of usage, maintenance and sustainability

**UNIT III :Faecal Sludge treatment** **9 hrs**
Faecal Sludge treatment -Single /twin pit, EcoSan, Septic tank, Formal sewerage, Sanitation infrastructure Status evaluation; Robust decentralised /centralised solutions including, source segregation, composting and recycling, Zero Waste Institution; Wastewater technologies to separate black and grey water, waste water treatment methods, Quality of treated water, Sludge management treatment and wetland treatment

**UNIT IV :Sanitation Infrastructure** **9 hrs**
Evaluation of Construction and Maintenance of Community, Public, Institutional and Individual Sanitation Infrastructure, Levels of investment, Resource Allocation, Subsidies for sanitation, Sanitation marketing

**UNIT V : Community Sanitation** **9 hrs**
Community Sanitation, Maintenance of Community Toilets, IHHL procedures, Promotion of Sanitation & Hygiene, Capacity Building at Community level, Subsidy Mechanism, Working with Communities & households

**TOTAL : 45 hrs**

**Reference Books:**

1. S Gupta, "Rural water supply and sanitation" Vayu Education of India, 1st edition, 2012
2. UNICEF and Ministry of drinking water and sanitation, "Manual on liquid and solid waste management"

**21GWB1**

**MARKET INTEGRATION FOR WASTE MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To understand the Sales & Distribution functions as integral part of marketing functions in a business firm.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in sales and distribution management | 3 | | | 3 | | |
| CO2 | Describe the personal selling process | 3 | | | | | |
| CO3 | Manage and motivate the sales force | 3 | | 3 | | 3 | |
| CO4 | Distinguish between the different marketing channels and their appropriateness for different situations | 3 | 3 | | 3 | 3 | 3 |
| CO5 | Devise and monitor supply chains | 3 | | | | 3 | 3 |

**UNIT I :Introduction to sales and distribution Management** **9 hrs**

Nature and scope of sales management, personal selling objectives, Types of sales management positions, theories of personal selling, personal selling strategies, sales forecasting and budgeting decisions, emerging trends in selling, ethical leadership, case analysis

**UNIT II :Personal selling process, sales territories and quotas** **9 hrs**

Selling process, relationship selling, designing sales territories, sales quotas and sales organization structures, case analysis.

**UNIT III :Sales Force & Distribution Management** **9 hrs**

Sales Force Management: Recruitment and selection of sales force, training, motivating and compensating the salesforce, controlling the salesforce, case analysis.

**UNIT IV :Distribution Management** **9 hrs**

Introduction, need and scope of distribution management, marketing channels strategy, levels of channels, institutions for channel-retailing wholesaling, designing channel systems, channel management, case analysis.

**UNIT V :Management of logistics & SCM** **9 hrs**

Definition & Scope of logistics, Components of logistics, inventory & warehouse management, transportation, channel information systems, Extension into Supply Chain Management distribution management in international market. Online market places- B2B, B2C, C2C, online auction, specific online market places for energy, construction, recycling, reuse, government market places

**TOTAL : 45 hrs**

**Reference Books:**


1. Spiro Stanton Rich, "Management of Sales Force", TATA Mcgraw Hill Co., 2015.
2. Richard R Still and Others, "Sales Management",6th edition, 2017.
3. Rosen bloom, "Marketing Channels", Cengage Learning, 8th edition, 2012.
4. Shah, J, "Supply Chain Management", 2009, 1st Ed. Pearson.
5. Gary Schnider. Electronic commerce. Course technology, 19th edition. 2014.

**21GWB2**
**CONSUMER BEHAVIOUR**

**3 0 0 3**

**Learning Objective(s):** To understand how consumers make purchase decisions.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in consumer behaviour | 3 | | | 3 | | |
| CO2 | List the internal determinants of consumer behaviour | 3 | 3 | | | | |
| CO3 | Identify and enumerate the external determinants of consumer behaviour | 3 | 3 | | | | |
| CO4 | Understand and influence the consumer decision making process | 3 | 3 | | 3 | 3 | 3 |
| CO5 | Devise customer relationship management programs for different businesses | 3 | | 3 | | 3 | 3 |

**UNIT I :Introduction to Consumer Behaviour** **9 hrs**
Concept- Types of consumers- Current trends in consumer behaviour- Approaches to studying consumer behaviour- Inter- disciplinary analysis- Consumer Behaviour applications in designing marketing strategies- Problems in studying consumer behaviour.

**UNIT II :Internal Determinants of Consumer Behaviour** **9 hrs**
Motivation- Learning- Perception- Attitude- Personality and Lifestyle.

**UNIT III :External Determinants of Consumer Behaviour** **9 hrs**
Family- Social Class- Reference Group and Opinion Leader- Diffusion of innovations- Culture and subculture- Relationship marketing.

**UNIT IV :Consumer decision making process** **9 hrs**
Consumer Decision Making Process and Models: Howard Sheth Model- EKB Model- Organizational Buyer Behaviour and Influences on Organizational Buyer Behaviour, Post purchase behaviour, Consumer Dissonance, Post- purchase cognitive dissonance.

**UNIT V :CRM concept and components** **9 hrs**
Evolution, development & challenges in implementing CRM Organization for CRM, CRM Strategy cycle – CRM Program measurement and Tools – CRM practices in Banking, Insurance and Retail. Emerging trends- emerging issues, past, and present marketing apps.

**TOTAL : 45 hrs**

**Reference Books:**

1. Schiffman& Kumar, "Consumer Behaviour", 11th Edition, Pearson Education India, 2017
2. East, R., Wright, M. &Vanhuele, M, "Consumer Behaviour: Applications in Marketing", 2nd Edition, SAGE Publication, 2016.
3. Motherbaugh&Mookerjee, "Consumer Behaviour: Building Marketing Strategy", 12th Edition, Mcgraw Hill Education (India) Private Limited, 2018.
4. RamanujMajumdar, "Consumer Behaviour: Insights from Indian Market", Kindle Edition, PHI, 2017.
5. Satish K Batra&Kazmi, "Consumer Behaviour", 2nd Edition, Excel Book.2018.

**18GWB3**
**INTEGRATED MARKETING COMMUNICATION**

**3 0 0 3**

**Learning Objective(s):** To understand about the various marketing communication tools and their effectiveness.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in integrated marketing communication | | | | 3 | | |
| CO2 | Identify the elements in the communication process | | | | 3 | | |
| CO3 | Devise an approach for marketing communication | 3 | | | 3 | 3 | 3 |
| CO4 | Develop a complete ICM program | 3 | | | 3 | 3 | 3 |
| CO5 | Measure and control marketing programs through tools | 3 | 3 | | 3 | 3 | 3 |

**UNIT I :Introduction to IMC** **9 hrs**
IMC – Definition and role, Global Developments in IMC, Introduction to IMC tools and techniques, Marketing Objectives and IMC, Strategies by waste and recycling industry

**UNIT II :Understanding Communication Process** **9 hrs**
Introduction to the communication process, Identifying important elements in communication, Information processing approaches and human cognition, AIDA model, Hierarchy of effect model and the Innovation adoption curve

**UNIT III :Planning for Marketing Communication (Marcom)** **9 hrs**
Establishing Marcom Objectives and Budgeting for Promotional Programs-Setting communication objectives, Sales as Marcom objective, DAGMAR approach for setting ad objectives. Budgeting for Marcom-Factors influencing budget, Theoretical approach to budgeting viz. Marginal analysis and Sales response curve, Method to determine Marcom budget.

**UNIT IV :Developing IMC Programs** **9 hrs**
Planning and development of creative Marcom. Creative strategies in advertising, sales promotion, publicity, event sponsorships etc. Creative strategy in implementation and evaluation of Mrcom-Types of appeals and execution styles. Media planning and selection decisions- steps involved and information needed for media planning

**UNIT V :Measuring effectiveness and Control of Promotional Programs** **9 hrs**
Meaning and importance of measuring communication effectiveness, the testing process, measuring the effectiveness of other promotional tools and IMC. The ethical, social, and legal aspects of advertising and promotion-, Social Communication Different legislative and self regulatory codes controlling advertising and promotions in India viz. advertising councils code, print media codes, broadcasting media codes and regulations governing sales promotion, packaging, direct marketing and internet marketing.

**TOTAL : 45 hrs**

**Reference Books**:

1. Yeshin, Tony. "The integration of marketing communications." The marketing book (2003): 395.
2. Chaffey, Dave, and Fiona Ellis-Chadwick. Digital marketing. Pearson UK, 2019.
3. GerardusBlokdyk. Integrated marketing Management.5starcooks, 3rd edition, 2018.
4. Belch, George E. and Michael A. Belch, “Advertising and Promotion: An Integrated Marketing Communications Perspective”, 11th Edition, Tata McGraw-Hill, 2018.
5. Kenneth E. Clow and Donald Baack, “Integrated Advertising, Promotion and Marketing Communications, 8th Edition, Pearson, 2017.

**21GWB4**
**SERVICE MARKETING**

**3 0 0 3**

**Learning Objective(s):** To become familiar with the concepts of service relationship management, role of intermediaries, challenges of distribution in large domestic markets and need for short-term and long-term customer engagement.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in services marketing | 3 | 3 | | 3 | | |
| CO2 | Position services by understanding consumers and markets | 3 | | | 3 | 3 | 3 |
| CO3 | Plan and create service products | 3 | | | | 3 | 3 |
| CO4 | Design and manage service processes | 3 | | | | 3 | 3 |
| CO5 | Manage relationships and implement service strategies | | | 3 | 3 | 3 | 3 |

**UNIT I :Understanding Service Products** **9 hrs**
Introduction, importance of services in economy, service environment, Why study services? Industries or the Service Sector? Powerful forces transforming service market; four broad categories of services-A service perspective, Services pose distinct marketing challenges, the traditional marketing mix applied to services, the extended services marketing mix for managing the customer interface, a framework for developing effective service marketing strategies

**UNIT II :Understanding Consumers and Markets** **9 hrs**
Consumer Behaviour in service context, Positioning services in competitive markets, segmentation and targeting, purchase model

**UNIT III :Apply the 4ps of Marketing to Services** **9 hrs**
Apply the 4ps of Marketing to Services: Planning and creating service products, The flower of service, Branding service products and experiences, New service Development, Distribution in a services context, Distribution options for serving customer: Determining the type of contact, Place and Time Decisions, Delivering services in cyberspace, The role of intermediaries, The challenges of Distribution in large domestic markets, Distributing services internationally, Setting price and implementing revenue management, Promoting services and educating customers

**UNIT IV :Managing the Customer Interface** **9 hrs**
Designing and managing service processes-Flowcharting customer service processes, Blueprinting, Service process redesign, Balancing demand and productive capacity-Fluctuations in Demand threaten profitability, crafting the service environment, managing people for service advantage

**UNIT V :Implementing profitable Services Strategies** **9 hrs**
Managing relationships and building loyalty-The search for customer loyalty, Understanding the customer firm relationship, the wheel of loyalty, Strategies for developing loyalty bonds with customer, Complaint Handling and Service Recovery, Improving Service Quality and Productivity, Striving for service leadership, Balancing demand and productive capacity-Fluctuations in Demand threaten profitability, Gap model 2 analysis

**TOTAL : 45 hrs**

**Reference Books:**


1. JochenWitz, "Services Marketing : People, technology & Strategy", World scientific, 8 the edition, 2016
2. Helen Woodrfuff, "Services Marketing", Himalayan Publishing House,2017.
3. Jeff Toister,"The Service Culture Handbook: A Step-by-Step Guide to Getting Your Employees Obsessed with Customer Service", AMACOM, 2016.
4. Roland Rust, "Services Marketing", Macmillan Limited, 2016.
5. Zeithaml, V.A., Bitner, M.J., Gremler, D.D, "Services Marketing: Integrating Customer Focus Across the Firm", McGraw-Hill Education, 7th Edition, 2018.

**21GWB5**
**PRODUCT AND BRAND MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To become familiar with the concepts and practices in Product Management, Brand Management, Product Strategy, Product Planning, Product Offering and Brand equity.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in product strategy | 3 | | | 3 | | |
| CO2 | Perform competitor and customer analysis | 3 | 3 | | 3 | 3 | |
| CO3 | Develop processes for new product creation and product strategies | 3 | | | | 3 | 3 |
| CO4 | State the principles, types and models associated with branding | 3 | | | | 3 | |
| CO5 | Create brand positioning and strategy | 3 | 3 | | | 3 | 3 |

**UNIT I :Product and Product Strategy** **9 hrs**
Introduction to Product and: Product Strategy and Planning, Product and Market Focused Organizations, Product and Market Evolution, Product Life Cycles, Branding (to create awareness on waste management)

**UNIT II :Introduction to Competitive Structure** **9 hrs**
Defining the Competitive Set, Category Attractiveness Analysis, Competitor Analysis and Customer Analysis.

**UNIT III :Product Strategy, Product Offering and Analysis** **9 hrs**
Developing Product Strategy, New Product Development, Designing the Offer, Market and Sales Potential, Pricing Decisions, Advertising and Promotion decisions, Concept and Product Testing, Financial Analysis for Product Management

**UNIT IV :Brands, Branding and Brand Equity** **9 hrs**
Introduction to Brands and Branding, Rationale for Building Brands, Types of Brands, Creating a Brand Designing Brand Identity using Kapferer's Identity Prism, Customer Brand Building Equity Model, Strategic Brand Wheel and Maps, Brand Mantras, Organization and Branding, Brand Equity and Building Brand Equity, Measuring Brand Equity.

**UNIT V :Brand Positioning and Branding Strategy** **9 hrs**
Brand Positioning, Consumer Behaviour, Crafting Brand Positioning Strategy, Building Marketing Programs for Brands, E-Branding and building Online Brands, Brand Strategies including Line and Category Extensions, Umbrella Branding and Managing the Brand Architecture

**TOTAL : 45 hrs**

**Reference Books:**

1. Donald Lehman and Russell Winer, "Product Management", Tata McGraw Hill, 4th edition, 2004.
2. U.C .Mathur, "Product and Brand Management", Excel Books. 2nd edition, 2012
3. David Aaker, "20 Branding Principles That Drive Success", Sage Publication, 2015
4. Isaac C. Jacob Kevin Lane Keller, VanithaSwaminathan, Ambi M.G. Parameswaran, "Strategic Brand Management", Pearson, 5th Edition, 2020.
5. J N Kapferer, "The New Strategic Brand Management", Kogan Page, 5th edition, 2017

**21GWB6**

**WASTE EXPORTS, PROCEDURES AND DOCUMENTATION**

**3 0 0 3**

**Learning Objective(s):** To become familiar with the nature, procedures and documentation involved in export-import business and trade regulations.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts associated with exporting | | | | | | 3 |
| CO2 | Understand and enumerate the export procedure | 3 | 3 | | 3 | 3 | |
| CO3 | Understand and utilize the different export documents | 3 | | | 3 | 3 | |
| CO4 | Interact with institutions for export related financial transactions | 3 | | | | 3 | |
| CO5 | Devise risk mitigation methods | 3 | 3 | | | 3 | 3 |

**UNIT I :Meaning and definition of export** **9 hrs**

Classification-strategy and preparation for export marketing- Export marketing Organizations-Registration formalities-IEC-RCMC-export licensing –selection of Export Product-Identification of Markets-Methods of Exporting-Pricing Quotations-Payment terms-letter of credit.

**UNIT II :Export procedure** **9 hrs**

Starting an export firm- selection of an export product, market and buyer- Registration procedure with sales Tax, Central exercise and various boards and councils. Quality Control and Pre-shipment; inspection concept scheme and procedures. Export Promotion Councils; Commodity Boards/Product Export Development Authorities; Specific Service Institutions

**UNIT III :Export Documents** **9 hrs**

EXIM code number-Elements of export contract-In co terms-Terms of payment and letter of Credit. Export Documentation: Types of documents-Transport, Negotiation and insurance documents. Processing of an Export Order: World Shipping: Structure, Liners and Tramps, Conference System Freight; and Structure. Containerisation and other developments, International Agreements and Conferences on Sea Transport. Concepts of Dry Port, Containerisation, Air Transport: International set-up, Freight rate structure. Role of Clearing and Forward Agents.

**UNIT IV :Sources of finance** **9 hrs**

Role of commercial bank, EXIM Bank, ECGC and others-Export Promotion Schemes-Insurance for Export-Types –export credit insurance

**UNIT V :Risk Management** **9 hrs**

Types of Risks-mitigation methods. Documentation for Availing Export Incentives – Duty Drawbacks. Foreign Exchange Regulations and Formalities; Role of State Trading Organizations in Foreign Trade, Export Processing Zones; Export Oriented Units and Export and Trading House Schemes

**TOTAL : 45 hrs**

**Reference Books:**


1. PK Khurana, “Export Management”,Galgotia publishing company, 8th edition, 2014.
2. Foreign Trade Policy: Hand book of Export Procedure and Annual of the Ministry of Commerce, Government of India
3. Paras Ram “ Export: What, Where and How” Anupam Publication, Delhi, 47th edition, 2017.
4. Nabi’s Board of editors, “Export and Import”, Nabhi Publications, New Delhi., 2019.

**21GWC1**
**E-WASTE MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To provide insights in to generation of e-waste, hazardous nature of e-waste and life cycle of EEE.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Enumerate the sources of E-Waste generation | 3 | | | | | |
| CO2 | Investigate ICT trends | 3 | 3 | | 3 | 3 | 3 |
| CO3 | Describe and analyse the adverse impacts of E-waste | 3 | 3 | | 3 | 3 | |
| CO4 | Understand E-waste life cycle and regulations | 3 | 3 | | 3 | 3 | |
| CO5 | Devise opportunities for recycling and refurnishing | | | 3 | | 3 | 3 |

**UNIT I :Generation of E-waste** **9 hrs**

Generation of E-waste& it's comparison with other countries; e-waste as fastest obsolete items; digitalization of nations; increase in e-waste amounts – trends & reasons; Classifications for E-waste; segregation of e-waste; e-waste identified 17 Sustainable Development Goals (SDGs); Planned Obsolescence; International E-waste Statistics, International Laws

**UNIT II :Information and Communication Technology** **9 hrs**

Information and Communication Technology (ICT) and EEE Consumption Trends, Expanding Networks, More Internet Users, and Online Businesses, Falling Prices

**UNIT III :Hazardous nature of e-waste** **9 hrs**

Hazardous nature of e-waste, E-waste in Waste Bins; Illegal dumping of E-waste; Urban Mining of E-waste, Potential value of raw materials in e-waste; toxicity of e-waste; public health impacts & environment impacts of e-waste Risk assessment due to e-waste on soil, air & water; extraction of valuable resources from e-waste techniques & potential applications

**UNIT IV :Life cycle of EEE into e-waste** **9 hrs**

Life cycle of EEE into e-waste, common e-waste management scenarios; Official Take-Back System, Transboundary Movement of E-waste, Extended Producers Responsibility, EPR, Sustainable technologies for producers; International Laws on E-waste; Take-back Laws; necessity for government regulation; developed and developing nations; ; E-waste Legislation & comparison with other countries

**UNIT V :Recycling& Refurnishing** **9 hrs**

Recycling & Refurnishing: introduction; recycling of different types of e-waste, business opportunities in recycling, market consumer analysis profitability; product stewardship in EEE products; Industrial clusters; History of Metal Recycling; e-waste rules in India; Recycling Parties; e-waste recycling in formal, informal sectors(business model)

**TOTAL : 45 hrs**

**Reference Books:**


1. Balde, Cornelis P., Forti, Vanessa, Gray, Vanessa, Kuehr, Ruediger and Stegmann, Paul, "The Global E-waste Monitor 2017: Quantities, Flows and Resources", Bonn, Geneva, and Vienna: United Nations University, International Telecommunication Union, and International Solid Waste Association, 2017.
2. Book on E-waste by Royal Society of Chemistry, chapter 8, RSC Publishing, 2019.
3. David M Barkch. "E – Waste" , Abdo publishing, 1st edition. 2017.
4. NPCS Board of Consultants & Engineers, "The complete technology book on e-waste Recycling", Asia Pacific Business Press Inc., 2018

**21GWC2**

**RESOURCE EFFICIENCY AND RESOURCE RECOVERY**

**3 0 0 3**

**Learning Objective(s):** To provide insights into efficient resource utilisation and "waste to wealth" concepts like Life-cycle analysis(LCA).

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in resource utilization efficiency and recovery | 3 | | | | | |
| CO2 | Identify trends in consumerism | 3 | 3 | | 3 | 3 | 3 |
| CO3 | Promote ways to reduce the use and throw culture | 3 | | 3 | | 3 | 3 |
| CO4 | Recollect the fundamentals of sustainability | 3 | 3 | 3 | | 3 | |
| CO5 | Identify and devise ways to recover precious resources like water | 3 | 3 | 3 | | 3 | 3 |

**UNIT I :Introduction** **9 hrs**

Introduction – Definitions, differences, advantages, Circular economy, Resource security, Ways to minimize impact on environment &societal burdens, Life-cycle analysis(LCA), Zero Waste Strategy, Improvements to administration, source separation and collection, reuse and recycling

**UNIT II :Consumerism** **9 hrs**

History, Advertising – a Vicious Trap; Problems with Consumerism, Efficiency of Resource Use-Production and Consumption, patterns of consumption, Eco- labels – importance, increasing eco-labels

**UNIT III :Use& Throw Culture** **9 hrs**

Disposable Products, Comfort vs. Cost of disposables, Higher Resource efficiency, thoughtless extensive use and disposal of resources, Changing habits, Promoting plastic free living, increase demand for recycled materials

**UNIT IV :Building Sustainability** **9 hrs**

Basic Principles Of Sustainable Waste Management, traditional reductionist approach, Role of EPR, Sustainable Materials Management, Living a Minimalist Lifestyle, Sustainable waste management an opportunity, not burden, Sustainable waste management implementation requires – dedicated financial support and political will, Systems and processes that change organizations from managing wastes to a resource recovery system

**UNIT V :Resource Recovery** **9 hrs**

Resource recovery in the context of sanitation (waste water and human excreta) Toilet resources: nutrients (nitrogen and phosphorus), organic matter, energy and water, role of incentives in design of recycling programs, Energy recovery from waste Electricity from biodegradable (waste burning) power plant, industrial water reuse, Reuse of water from kitchen, and water basins for gardening

and irrigation, recovery of methane gas from solid waste dumping sites for energy, reuse of plastic for road building-plastic road. Recovery of water- waste water treatment using constructed wetland techniques, removal of heavy metals using hydrophonic methods, utilisation of fly ash as bricks and use as cement component, sludge treatment- used as bio fertilizers. Urine as fertilizer, biogas from human excreta

**TOTAL : 45 hrs**

**Reference Books:**


1. Niall Enrigt, "Energy and Resource Efficiency without the tears" ,vol I and II, Iwik Publishers, 2017.
2. John Pichter, "Waste Management Practices: Municipal, Hazardous and industrial", 2nd Edition. CRC Press, 2014.
3. BanwariLal and Priyanshu Sharma, "Wealth from Waste: Trends and technologies", 4th Edition. Tata McGraw Hill, 2009.

**21GWC3**
**INTEGRATED WASTE MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To provide insights into Integrated Waste Management and business models for creating wealth from waste.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in integrated waste management | 3 | | | | | |
| CO2 | Appreciate and develop a life cycle perspective with respect to waste management | 3 | 3 | | | 3 | |
| CO3 | Design sustainable management approaches for waste | 3 | 3 | 3 | | 3 | 3 |
| CO4 | Creating opportunities for generating wealth from waste | 3 | | 3 | | 3 | 3 |
| CO5 | Understand and develop appropriate business models to convert waste to energy | 3 | 3 | 3 | 3 | 3 | 3 |

**UNIT I :Introduction** **9 hrs**

Integrated Waste Management – basics, Elements in IWM, Characteristics of IWM, Strategic Planning for IWM, Implementing IWM, Importance of Integrated Solid Waste Management (ISWM), Goals, Functional Elements Priorities of Integrated Waste Management, Benefits of IWM for developing economies, Geographical Coverage of Integrated Waste Management

**UNIT II :Life Cycle Perspective** **9 hrs**

Understanding the Life Cycle Perspective, Generation Source Perspective, Stakeholders'/Management Perspective of Integrated Waste Management, Planning public involvement, Alternatives approaches, Development of the Integrated Waste Management Facility, Decentralised waste management

**UNIT III : Sustainable management** **9 hrs**

Designing Approaches to sustainable management of wastes covering all sources and all aspects, covering generation, segregation, transfer, sorting, treatment, recovery and disposal in an integrated manner, with an emphasis on maximizing resource use efficiency

**UNIT IV :Wealth from Waste** **9 hrs**

Wealth from Waste- consumers as active participants; an art for some; entrepreneurship for some; Social implications, Creating social and environmental dividends contributing healthy communities, From waste to food; articles out of waste; composting units; Refuse-derived fuels

**UNIT V :Waste Collection and Processing** **9 hrs**

Waste Collection, Inorganic Waste processing, Organic Waste processing, Building business models of creating wealth from waste and providing employment, Creating new opportunities for local economic development, Social and economic reflections on Waste for Energy, Increasing costs of

W2E treatment (and disposal), Major concerns with Waste for Energy approaches, W2E is not a 'green' technology, Multinational funding of Waste to Energy.

**TOTAL : 45 hrs**

**Reference Books:**


1. A. J. Nordone, P. R. White, F. McDougall, G. Parker, A. Garmendia, M. Franke, "Waste Management and Minimization – Integrated Waste Management", Encyclopediaof Life Support Systems (EOLSS), Procter and Gamble, Newcastle, UK
2. JuttaGutberlet, "Waste to Energy, Wasting Resources and Livelihoods", Research gate, 2011.

**21GWC4**
**BIO MEDICAL WASTE MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To provide insights into prevention of transmission of communicable diseases and handling of risks in healthcare.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | List the sources and types of biomedical waste | 3 | | | | | |
| CO2 | Enumerate the impacts of non-management of biomedical waste on life | 3 | | | | 3 | |
| CO3 | Appreciate and identify the legislations concerned with biomedical waste | 3 | 3 | | | 3 | |
| CO4 | Create processes for managing different types of biomedical wastes | 3 | | | | 3 | 3 |
| CO5 | Identify and take steps to ensure good health and safety practices for handlers of bio medical waste | 3 | | 3 | | 3 | 3 |

**UNIT I :Sources of Biomedical Waste** **9 hrs**

Overview of Biomedical Waste, Sources of Biomedical Waste, Categories of Biomedical Waste, definition of general and hazardous biomedical waste and diseases, Infectious waste, genotoxic waste, waste sharps, biomedical waste categories, categorization and composition of Biomedical waste Specification of materials, Colour coding, Sources of Health care wastes, Hospitals and health care establishments & other sources, Primary health care facilities- BMW management

**UNIT II :Impacts on health** **9 hrs**

Specific Communicable diseases, Diseases epidemiology and mode of transmission of disease and prevention, consequences and remedies, Health impacts of biochemical waste, Direct & indirect hazards, Potential health hazards, Persons at risk, Basic information about infection, Infection agents on organizations spread of infection and Hospital acquired infection, Communication about Workplace Hazards, Safety precautions for doctors, nurses, para-medical staff, waste handlers.

**UNIT III :Legal aspects** **9 hrs**

Legislation, policies and law regarding bio medical waste management, Biomedical waste management and handling rules, CPCB guidelines, (Central pollution control board) Safe disposal of Radioactive waste rules, guideline of BARC, International Scenario World Health Organization guidelines on Management of wastes from Hospitals wastes, Hospital budget allocation for hospital waste management, Maintenance of records, annual report.

**UNIT IV :Steps Involved in Biomedical Waste Management** **9 hrs**

Basic steps in Biomedical Waste Management, Segregation at the point of generation sharp Decontaminating/Disinfections unit or container for autoclaving Sharp waste containers for Collection and Storage and transportation autoclaving/ shredding /incineration /bio hazard symbols,

Microwave, Hydropulbing, plasma torch, segregation, transport within the hospital to central waste management facility, CBWMTF- land requirement, facility requirement, Treatment and Disposal

**UNIT V :Management and Administration** **9 hrs**

Collection of waste, Principles of Safe Handling, Infection control system in hospital, Needle sticks injury and other sharp injury and hospital policy for protection of health care workers, On site Pre-treatment of waste Mechanical Treatment & Chemical Disinfections store & Off-site transportation, Health & safety Practices Usage of protective equipment Occupational health programmers & safety practices, Emergency measures, Measures for Waste Minimization, Zero Waste Hospital, Stakeholders of Waste Management

**TOTAL : 45 hrs**

**Reference Books:**

1. Srishti, 5th survey of medical waste disposal practices in health care units of Delhi. New Delhi.2000.

**21GWC5**
**WATER RESOURCE MANAGEMENT**

**3 0 0 3**

**Learning Objective(s):** To provide insights into reducing water usage and improving quality of waste water.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Provide an overview of water security issues | 3 | | | | | |
| CO2 | Enumerate responsibilities towards production and disposal of waste water | 3 | | | | 3 | |
| CO3 | Identify alternate technologies for waste water treatment | 3 | 3 | | 3 | 3 | 3 |
| CO4 | Understand and implement clean water solutions | 3 | | 3 | 3 | 3 | 3 |
| CO5 | Monitor water, waste water, soil and solid waste | 3 | 3 | | | 3 | |

**UNIT I :Water Issues** **9 hrs**

Overview of Water Security, Inequitable Global Distribution of water, Water quality, Individual & Community responsibility towards water Management; Consequences of Water Pollution, Causes of Water Pollution, Types of Water Pollution, Biohazard, Radiation Hazard and Security Threat

**UNIT II :Waste Water Management** **9 hrs**

Individual responsibility towards wastewater production, Community responsibility towards waste water disposal, Municipal responsibility for treating waste water, Conventional Waste water treatment: Sewage Treatment Plants, Issues facing present day STPs, Treatment of Leachate from Waste Dumps; Used water treatment for homes & small organizations; community level or decentralized used water treatment- involvement of communities or Self Help groups

**UNIT III :Alternative Technologies for Waste Water Treatment** **9 hrs**

Alternative technologies for waste water treatment, Summary of waste water treatment technologies, Biological Nutrient Removal Systems, Sludge Management, Disinfection; Primary, Secondary & Tertiary Treatment of Water; Eco-friendly technologies in water treatment

**UNIT IV :Clean Water Solutions** **9 hrs**

Introduction, Ancient Water Technology, Rainwater Harvesting, Solution for Flood Management, Watershed Management, Urban Watershed Management, River Restoration, Water Reclamation, Individual Responsibility, Community Responsibility

**UNIT V :Testing of Water, Waste Water, Soil and Solid Waste** **9 hrs**

Importance of Water Monitoring; Water sampling techniques, Water analysis parameters, Microbiological Analysis, Toxicity Characteristic Leaching Procedure (TCLP), Soil Testing, Soil Sampling, soil monitoring, soil quality parameters, TCLP, treatment of leachate from dump-yards

**TOTAL : 45 hrs**

**Reference Books:**


1. Lankford, Bruce; Bakker, Karen; Zeitoun, Mark, Conway, Declan, "Water Security: Principles, Perspectives and Practices (Earthscan Water Text)", 1st Edition, Routledge, 2013.
2. World Health Organization and UN-Habitat 2018, Progress-on-wastewater-treatment, 2018.
3. World Health Organization, Guidelines on Sanitation and Health. Geneva: Licence, 2018.

**21GWC6**
**WASTE MANAGEMENT BANKS**

**3 0 0 3**

**Learning Objective(s):** To provide insights into how a waste bank can act as an intermediary institution for transforming trash into cash.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the significance of Waste Banks | 3 | | | | | |
| CO2 | Devise plans for reusing and recycling | 3 | | 3 | | 3 | 3 |
| CO3 | Appreciate and create different types of banks | 3 | | 3 | | 3 | 3 |
| CO4 | Streamline community based waste management efforts | | | 3 | | 3 | 3 |
| CO5 | Monitor and analyse the impact of waste banks in local economy | 3 | 3 | | | 3 | |

**UNIT I :Waste Banks** **9 hrs**
New concept, Importance and need, turning kabadiwallahs into bankers – an organised sector, Waste circulation through waste bank, Advantages of waste banks

**UNIT II :Reuse / Recycle methods** **9 hrs**
Deposit waste, distribution, identification and linking with the needy humans – beggars, old age homes, orphanages; Food waste - supply to animal shelters, goshalas, piggeries; e-waste and plastic, other lethal waste – link with authorised specific dealers; Bio-degradable waste – compost and sell

**UNIT III :Simple daily banks** **9 hrs**
Clothes banks, books banks, toy banks, e – banks, Food banks, Scrap metals, MedicineBanks, Plastic banks, Household items bank, Furniture banks– connect to resale, recycle or reuse, drop off and buyback centre

**UNIT IV :Community-Based Waste Management** **9 hrs**
Community-Based Waste Management, Local Economic Development (LED), Community Economic Development (CED), Decentralized waste banks, trash banks, garbage banks

**UNIT V :Leadership, Management and Incentives in Waste Banks** **9 hrs**
Leadership, Management and Incentives in Waste Banks, Partnership in the Waste Bank, Impact of Waste Bank to Local Economy, Waste Bank as Household Waste Management, Motivate public through schemes of tax reduction, Safety of waste handlers – body equipment

**TOTAL : 45 hrs**

**References Books:**


1. SunitaNarain, Swati Singh Sambyal, "Not in my Backyard", Centre for Science & Environment, 2018.
2. Kaza, Silpa, Yao, Lisa C., Bhada-Tata, Perinaz, Van Woerden, Frank, "What a waste 2.0 - A global snapshot of Solid Waste Management to 2050", The World Bank Group, 2018
3. Wijayanti, D. R., &Suryani, S. (2015). Waste bank as community-based environmental governance: a lesson learned from Surabaya. *Procedia-Social and Behavioral Sciences*, *184*, 171-179.

**21GWC7**

**WASTE MANAGEMENT TECHNOLOGIES**

**3 0 0 3**

**Learning Objective(s):** To provide insights into designing new and efficient waste management techniques.

| CO# | At the end of the course, the student should be able to: | PROGRAMME OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Recall the principles and concepts in waste management techniques | 3 | | | | | |
| CO2 | Enumerate and utilize alternate technologies at different scales | 3 | 3 | | | 3 | 3 |
| CO3 | Design new techniques for material recovery | 3 | | 3 | | 3 | 3 |
| CO4 | Propose composting, recycling and treatment methods for different types of waste | 3 | 3 | 3 | | 3 | 3 |
| CO5 | Suggest remediation techniques | 3 | 3 | 3 | | 3 | 3 |

**UNIT I :Waste Management Techniques** **9 hrs**

Waste Management Techniques - Salient features, business profitability, environmental regulations and economic viability, product design for waste minimization, Waste Management interventions - generation, prevention, characterization, monitoring, treatment, handling, reuse and ultimate residual disposal of solid wastes, Household hazardous waste; environmental regulations, product design for waste minimization; waste management interventions; occupational risks in waste management techniques are more appropriate

**UNIT II :Alternative Technologies** **9 hrs**

Technological development, assess, analyse and material recycling systems with low environment loading and find better alternatives, Develop technologies for small & medium scale, techno-economic feasibility of proposed methodologies/ technologies, System to efficiently collect PET bottles, Biomass utilization technology, Home appliance recycling technology; Technological development, assess analyse material Recycling; Develop technologies for small & medium scale, techno-economic feasibility; Business utilization Science of recycling as waste categorization.

**UNIT III :Designing New Techniques** **9 hrs**

Green Product development and Design for recycling, Development of simple indigenous material recovery technology for specific applications (precious & other metals, plastics, glass and rare earths). Newer technologies for Biomedical Waste, Urban & Rural Solid Waste, including Plastic Waste, E-Waste (Electrical & Electronics Waste): Recycling & Recovery, Resource recycling technology to produce high quality products; Green Product Development & design for recycling; development of simple material recovery; newer technologies- recycling topics can all form a separate unit

**UNIT IV :Composting, Recycling & Treatment Methods** **9 hrs**

Composting: Types and processes, Counter Current Management, Recycling: Changed form; Reducing: Compacting, Reusing: with and without recasting, Incineration and pyrolysis, gasification technologies.

**UNIT V :Remediation** **9 hrs**

Landfill Bio-reactor; Existing Landfills: Gas Extraction, Leachate Treatment, Material Mining, Remediation, Value-added Material Recovery, Non-recyclable packaging material, Construction & demolition debris, Co- digestion of sewage sludge; Landfills: Aerobic and semi aerobic, Earth Layer and HDPE liner, Capping of Waste; Basic design on requirements for engineered landfills; landfills vs dump - site

**TOTAL : 45 hrs**

**Reference Books:**


1. Central Pollution Control Board, (2007). Guidelines for the selection of site for landfilling. New Delhi.
2. CPCB (2000), "Status Of Municipal Solid Waste Generation, Collection, Treatment And Disposal in Class I Cities", Central Pollution Control Board, Ministry of Forest and Environment, GOI, New Delhi
3. SWM (2016), Manual by Ministry of Urban Development

**21GWD1**
**BUSINESS ANALYTICS**

**3 0 0 3**

**Learning Objective(s):**This course introduces the fundamental concepts and tools needed to under the emerging role of analytics in business organizations. It helps the students to use data, method fact-based management to support and improve decision making. It demonstrates how to build ana models using R programming software. Emphasis is placed on applications, concepts and interpretat results, rather than programming and calculations.

| CO # | At the end of the course, the students should be able to | PROGRAM OUTCOMES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Understand the various concepts and types of business analytics | | 3 | | | | |
| CO2 | Ability to visualize and prepare the data using exploratory data analysis | | 3 | | | | |
| CO3 | Employ unsupervised learning techniques to discover hidden patterns in unstructured data | | | | 3 | | |
| CO4 | Employ supervised learning techniques to build models for prediction | | | | 3 | | |
| CO5 | Devise strategic alternatives for business decision making using supervised learning algorithms | | | | 3 | | |

**Unit 1 : Overview of Business Analytics** **9 hrs**

Big Data - Data Science - Business Intelligence – Business Analytics; Applications of Analytics - Types of Analytics Techniques - Descriptive analytics, Diagnostic analytics, Predictive analytics, Prescriptive analytics; Machine Learning Algorithms; R and R studio environment - Basics of R – Variable Types, Basic Operators, Functions, Vectors, Lists, Data Frame, R Packages

**Unit 2 : Exploratory Data Analysis and Data Visualization** **9 hrs**

Need for Exploratory Data Analysis - Analytics Process Model; Data Pre-processing Steps - Transforming variables, Creating Dummy variables, One hot encoding; Data Visualization Techniques - Univariate Plots - Histogram, Bar Plots, Pie Chart, Box and Whisker Plot, Density Plot; Multivariate Plots - Strip Chart, Scatter Plot, Heat Maps, GGPlots in R

**Unit 3 : Unsupervised Learning Algorithms** **9 hrs**

Unsupervised learning algorithm Techniques - Association rule mining - Transaction dataset, Support, Confidence, Lift , Apriori Algorithm, Item frequency plots, Association rules, Plotting of rules; Clustering Techniques - K-means Clustering - Hierarchical Clustering - Distance measures, Dissimilarity matrix, Linkage methods - Agglomerative clustering - Divisive clustering - Dendrogram; Unstructured Data - Text analytics - Word Cloud - Sentiment analysis - Word Polarity - Quantifying Sentiments

**Unit 4 : Supervised Learning Algorithms: Linear and Logistic Regression** **9 hrs**

Supervised Learning Algorithm Techniques - Regression - Multiple linear regression - Interpretation of Multiple Linear Regression Coefficients, Coefficient of Determination, Model performance measures; Classification Technique - Logistic Regression, Binary Logistic Regression, Sigmoid function Interpretation of Logistic Regression Parameters, Odds ratio, Variable selection

**Unit 5 : Supervised Learning Algorithms: KNN and Decision Tree** **9 hrs**

Frequency Based Algorithm - K-Nearest Neighbours - Similarity based on distance function, Select Appropriate K Value; KNN Model Building - Evaluating Model Performance; Decision Tree - Tree structure, Criteria for splitting the Decision Node - Classification and Regression Technique (CART)- Control Parameters, Pruning the tree, Important Variables, Insights from Decision Rules

**Total : 45 hrs**

**Reference Books:**


1. AntoniosChorianopoullos, "Effective CRM using Predictive Analytics", Wiley Publications, latest edition, 2016
2. Bart Baesens, "Analytics in a Big Data World – The essential guide to Data Science and its Applications", Wiley Publications, 2 nd edition, 2018
3. GalitShmueli, Peter C Bruce, Nitin R Patel, "Data Mining for Business Analytics – Concepts, Techniques and Applications", Wiley Publications, 2016 edition
4. James Evans, "Business Analytics", Pearson Publications, 2nd Edition, 2018
5. SandhyaKuruganti, Hindol Base, "Business Analytics - Applications to Consumer Marketing", McGraw Hill Education, 2 nd edition, 2017

**21GWD2**
**DATA VISUALIZATION**

**3 0 0 3**

**Learning Objective(s):** This course introduces the art and science of turning data into readable graphics. Students will also learn to evaluate the effectiveness of visualization designs, and think critically about each design decision, such as choice of color and choice of visual encoding

| CO # | At the end of the course, the students should be able to | PROGRAM OBJECTIVES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Explain data visualization process and explore different types of visualization and how humans perceive information. | 3 | | | | | |
| CO2 | Implement principles of design and color to make visualizations more engaging and effective and apply techniques from user-interface design to create an effective visualization system. | | 3 | | | | |
| CO3 | Develop Data Models and use the DAX Formula language and M language to develop POWERFUL calculations | | | | 3 | | |
| CO4 | Design visualization system for large datasets and dashboards using tableau and power BI , Python and R, interpret the visualization created from the data set | | | | 3 | | |
| CO5 | Build professional-quality business intelligence reports from the ground up and share for collaboration | | 2 | | | | |

**UNIT 1: Data Visualization –A primer of Business Intelligence** **8 hrs**
Business Intelligence - Data Visualization Evolution and Characteristics – Importance of Data Visualization –Data Visualization Process - Data Visualization Tools and Software - Data Visualization Techniques – Best Practices in Data Visualization

**UNIT 2: Data visualization Using Tableau – Basics** **9 hrs**
Introduction to Tableau – Tableau interface & Architecture – Data connections & Data Sources – Preparation of Data – Exploring and analyzing Data – Creating basic charts – Apply analytics to a worksheet – Creating Groups and Hierarchies - Mapping -Sharing Insights

**UNIT 3: Data visualization Using Tableau – Advanced** **9 hrs**
Advanced calculations - Parameters – Special Charts -Creation of Dashboards – Dashboard Actions - Story Boards Preparation - Sharing the work – Profile creation in Tableau Public

**UNIT 4: Reports & Dashboards using Power BI** **10 hrs**

Power BI introduction – Power BI Architecture & Process – Connecting Power BI with different Data Sources – Power Query for Data transformation- Data Modelling in Power BI – Reports – Visualization types in Power BI – Statics and Live Dashboards- Data Refresh & Security

**UNIT 5: Visualizing through R , Python &Qlikview** **9 hrs**

Grammar of Graphics – GGplot and visualizations using R – Advanced visualizations using matplotlib, seaborn and pyplot – Qlikview overview

**Total : 45 hrs**

**Reference Books**


1. Cole NussbaumerKnaflic, "Storytelling with Data: A Data Visualization Guide for Business Professionals", Amazon Asia-Pacific Holdings Private Limited, 1st edition, 2015.
2. Devin Knight, "Microsoft Power BI Complete Reference: Bring your data to life with the powerful features of Microsoft Power BI", Packt Publishing, 1st edition, 2018.
3. Eric Pimpler, "Data Visualization and Exploration with R: A practical guide to using R, R Studio, and Tidyverse for data visualization, exploration, and data science applications", Create Space Independent Public Platform,2018 latest edition
4. Ryan Sleeper, "Practical Tableau", O'Reilly Media,latest edition, 2018.
5. The Open University, "Visualization: Visual representations of data and information", Amazon Asia-Pacific Holdings Private Limited, latest edition, 2016.

**21GWD3**
**MACHINE LEARNING**

**3 0 0 3**

**Learning Objective(s) :**The course is designed to introduce students to machine learning algorithms from both theoretical and practical perspective, and gain experience of building predictive models using large datasets.

| **CO #** | At the end of the course, the students should be able to | **PROGRAM OBJECTIVES** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** |
| CO1 | Understand and explain the various concepts of machine learning and artificial intelligence | | 3 | | | | |
| CO2 | Employ supervised machine learning techniques to build classification models | | 3 | | | | |
| CO3 | Devise strategies using advanced machine learning techniques | | | | 3 | | |
| CO4 | Understand and explain the concept of artificial neural network and apply it predictive modelling | | | | 3 | | |
| CO5 | Identify trend and seasonality components and build predictive models for time series forecasting | | | | 3 | | |

**UNIT 1 : Introduction** **9 hrs**

Introduction to Machine Learning – Artificial Intelligence – Deep Learning - Practical Applications of Machine Learning, Artificial Intelligence, Deep Learning – Dimensionality Reduction Techniques – Factor Analysis

**UNIT 2 : Supervised Machine Learning Techniques** **9 hrs**

Conjoint Analysis – Full/fractional factorial design, choice cards , attribute Importance. Linear Discriminant Analysis - Fisher's method, Mahalanobis method, Standardised coefficients, Unstandardised coefficients, Structured coefficients. Naïve Bayes – Bayes theorem, conditional probability, building naïve bayes classifier

**UNIT 3 : Advanced Supervised Machine Learning Techniques** **9 hrs**

Random Forest – out of bag error rate, variable importance, tuning hyperparameters. SVM – hyperplanes and support vectors, SVM model building. Ensemble Methods – bagging, boosting, adaboost, gradient boosting, extreme gradient boosting, bias variance trade off, Synthetic minority oversampling technique.

**UNIT 4 : Artificial Neural Networks** **9 hrs**

Neural networks – Neural network model building – Perceptron – Bias – Activation Function – Hidden layers – Forward Propagation – Backward Propagation – Introduction to Convolutional Neural Network and Reinforcement Learning

**UNIT 5 : Time Series Analysis** **9 hrs**

Visualizing time series data - Components of Time Series Data - Stationarity of the Data - Differencing the Time Series – Time Series Models - Simple Exponential Smoothing, Double Exponential Smoothing, Holt's Model, Holt Winters – additive model, multiplicative model - Auto-Regressive Integrated Moving Average Model Building - Residual Analysis - Auto ARIMA Model

**Total : 45 hrs**

**Reference Books**


1. Daniel T.Larose and Chantal D, Larose, "Data Mining and Predictive Analytics", Wiley, 2nd Edition, 2018.
2. Dean Abbot, "Applied Predictive Analytics- Principles and techniques for the professional data analyst", Wiley, 2018.
3. Efraim Turban, Ramesh Sharda, DusunDelen, "Business Intelligence and Analytics- Systems for Decision support", Pearson, 10th Edition, 2018.
4. Gordon S.Linoff, MichealJ.A.Berry, "Data Mining Techniques", Wiley, 3rd Edition, 2017.
5. MehmedKantardzic, "Data Mining- Concepts, Models, Methods and Algorithms", Wiley, 2nd Edition, 2018.

**21GWD4**
**PYTHON PROGRAMMING FOR ANALYTICS**

**3 0 0 3**

**Learning Objective(s) :**This course introduces procedural programming for data analytics using Python language. It provides practical exposure to building machine learning models using Python and also introduces TensorFlow module to develop deep learning models.

| CO # | At the end of the course, the students should be able to | PROGRAM OBJECTIVES | | | | | |
|---|---|---|---|---|---|---|---|
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 |
| CO1 | Understand and explain the syntax, objects and functions of python programming | | 3 | | | | |
| CO2 | Employ python libraries like numpy and pandas for data handling | | 3 | | | | |
| CO3 | Design and interpret visualization models using data visualization libraries like matplotlib, seaborn and plotly | | | | 3 | | |
| CO4 | Employ python statistical libraries for predictive model building | | | | 3 | | |
| CO5 | Develop basic deep learning models using Tensorflow | | | | 3 | | |

**UNIT 1 : Introduction to Python** **9 hrs**

Python Overview – Environment Setup – Jupyter Notebook –Working Directory - Syntax, comments, variables, datatypes - numbers, strings, Booleans, operators, lists, tuples, sets, dictionaries – Operators in Python – Branching statement in Python functions, lambda, array, classes, objects, python dates, string formatting

**UNIT 2 : Python For Data Analysis** **9 hrs**

Python Libraries – Numpy – Vector and Matrix indexing, slicing, shape, reshape, joint split, sort filter, copy vs view - Random numbers; Pandas Library – Creating Dataframe, Slicing and Dicing the Data Frame, .loc and iloc, Adding Columns to Data Frame, Dropping Rows and Columns, Sorting Dataframe, Grouping the Data, Data cleaning and preprocessing

**UNIT 3 : Data Visualization using Python** **9 hrs**

Matplotlib Library –Histogram, Scatter Plot, Pie Chart, Area Chart, Meshgrid, Quiver Plot, Contour Plot; Seaborn Library - Count Plot, Bar Plot, Point Plot, Violin Plot, Swarm Plot, Rug Plot, Cat plot; Introduction to Plotly – Animated plots

**UNIT 4 : Model Building using Python** **9 hrs**

Statistical libraries for model building – Random forest, Support vector machines, ensemble methods

**UNIT 5 : TensorFlow** **9 hrs**

TensorFlow Basics – Introducing Tensors – Directed Graph – Visualizing a graph – Estimator API – Feature Extraction - Train a model – Simple programs in Tensor Flow - Deep learning with Tensorflow

**Total: 45 hrs**

**Reference Books**


1. Camm, Cochran, Fry, Ohlmann, Andeson, Sweeny, Williams, "Essentials of Business Analytics", Cengage Learning, 2019.
2. Nishant Shukla, "Machine Learning with Tensorflow", Manning Publications, 1st Edition, 2018.
3. Sebastian Raschka, VahidMirjalili, "Python Machine Learning", Packt Books, 2nd Edition, 2017.
4. Wes McKinney, "Python for Data Analysis : Data Wrangling with Pandas, Numpy and IPython", O'Reilly Media, 2nd Edition, 2017.
5. YehezkelS.Resheff, Itay Lieder, "Learning with Tensorflow : A Guide to Building Deep Learning Systems", O'Reilly Media, 1st Edition, 2017.