



**Cusrow Wadia Institute of Technology**  
**Pune 411 001**

**DEPARTMENT OF ELECTRONICS AND  
TELECOMMUNICATION ENGINEERING**

Multi Point Entry Credit System 2018

**CURRICULUM**

(W. E. F. June 2018)

# Cusrow Wadia Institute of Technology, Pune 1.

## CURRICULUM REVISION (2018)

### 1. Preamble:

- Cusrow Wadia Institute of Technology, Pune was granted Academic Autonomy in the year 1985 by Government of Maharashtra vide letter No. PTI 2483/119915(234)/TE-I (B) dated 27/2/1985.
- Initially the Institute adopted the Model Curriculum prepared by then TTTI, Western Region, Bhopal. Subsequently, the revisions in the curriculum were made as per the needs of the Society.
- The Institute adopted Multi Point Entry and Credit System w.e.f. June 1998.
- The earlier revision of the curriculum was carried out in the year 2014. Review of the curriculum adopted in 2014 was taken in the subsequent years. Necessary changes in the contents and detailing of the document as regards to the outcomes, implementation strategy and assessment were done by end of academic year 2017 - 18. The present outcome based curriculum will come into force w.e.f. June 2018.
- The feedback was taken from various stake holders and it was strongly felt that the rapid strides in the field of Information Technology, Computers and upcoming technology and allied processes, a dynamic curriculum need to adopt the benefits of the fast changing expectations in the contents as well as the Teaching Learning Methodology.
- The Institute has strengthened the hardware and software which is constantly consolidated and upgraded to match the needs of the society in general and the Industries in particular.
- Students should be proficient in the use of computers and related software irrespective of the branch of Engineering they are studying. The students shall be made to make maximum use of software packages and use Internet to derive and update their knowledge.
- The contemporary needs of the user system and overall development of the students is the governing factor in the revision of 2018 outcome based curriculum.

### 2. Approach for Curriculum Revision:

- The curriculum should help the students to acquire professional skills and inculcate attitudes in order that the student will be able to discharge the role and functions effectively on the societal and employment front.
- Scientific system approach has been adopted in the revision of this outcome based curriculum.
- A curriculum revision model showing various steps undergone is presented.
- Analysis of the existing curriculum was done by taking feedback from the faculty implementing the curriculum, Alumni, Industry / Field Personnel, Courses Committee Members and the Experts in the field of Education.

- Entry behaviour of the students was assessed. Basic entry qualification for Diploma is SSC or equivalent. However, higher entry qualification like 12<sup>th</sup> Science, 12<sup>th</sup> MCVV, ITI etc. was also considered.
- Curriculum documents of MSBTE, other Boards and other Autonomous Institutions were studied for inclusion of new courses and analysis of contents of existing and newly inducted courses and also the implementation strategy.
- The curriculum is rationalised as per the AICTE and MSBTE norms and guidelines.
- The team members were identified for collecting feedback from stake holders and interviews with Experts for noting the suggestions about the courses and necessary modifications. Interaction was carried out with expert from Industry and Academia. The faculty members were trained by specialists in Technical Education System as regards to the Curriculum Revision Process.

### **3. Roles to be played and functions to be performed by a diploma holder:**

- A Diploma holder may be employed in the Industry as a Technician or Supervisor for Production, Installation, Repairs and Maintenance. He may be an Entrepreneur, be assigned a job of Purchase/Marketing Department. Diploma holder should have basic knowledge of the various subjects of his branch in Engineering and also the related Inter-disciplinary subjects. He should be aware of the present technologies and be able to adopt the changes in future. He shall acquire the necessary skill sets in the Engineering subjects.
- His role in the Society is that of a responsible individual and should conduct himself as regards the values and cultures. He should acquire the necessary professional, presentation and managerial Skills.

### **4. Outcome Based Education (OBE)**

- The induction of India in the Washington Accord in 2014 with the permanent signatory status of The National Board of Accreditation (NBA) is considered a big leap forward for the higher-education system in India. It means that an Engineering graduate from India can be employed in any one of the other countries who have signed the Washington accord. For Indian Engineering Institutions to get accredited by NBA according to the pacts of the accord, it is compulsory that engineering institutions follow the Outcome Based Education (OBE) model.
- Cusrow Wadia Institute of Technology has adopted Outcome Based Education (OBE) model in revision of its curriculum effective from year 2018. Development of curriculum based on OBE model is a noteworthy step towards further improvement in quality of technical education at polytechnic level in this institute.
- Outcome based education (OBE) is student-centered teaching learning model that focuses on measuring student's performance through outcomes. Outcomes include knowledge, skills and attitudes. Its focus remains on evaluation of outcomes of the program by stating the knowledge, skill and behaviour a diploma holder is expected to attain upon completion of every course (Course Outcomes) and after three years of diploma program (Program Outcomes). Program specific outcomes (PSO's) are

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

- This OBE model measures the progress of the diploma holder in three parameters, which are
  - Program Educational Objectives (PEO)
  - Program Outcomes (PO)
  - Course Outcomes (CO)
- Program Educational Objectives (PEO) are broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve. PEO's are measured 4-5 years after graduation.
- Program outcomes are narrower statements that describe what students are expected to know and be able to do by the time he/she completes diploma education. They must reflect the seven Graduate attributes as described by NBA for polytechnic education programs. Course outcomes are the measurable parameters which evaluates each students performance for each course that the student undertakes in every semester.
- The assessment of outcomes is divided in two parts direct assessment and indirect assessment, direct assessment includes mid and end semester examinations, tutorials, assignments, project work, orals, practical examinations, continuous lab work assessment, presentations and carries weightage of 80%. Indirect assessment involves assessment through employer feedback, alumni feedback, parents' feedback etc and carries 20 % weightage. These course outcomes are mapped to Program outcomes based on relevance. This pattern of evaluation aids in effectively measuring the Program Outcome. The Program Educational Objective is measured through Employer satisfaction survey, Alumni survey, Placement records and higher education records.

## **5. Analysing Job Functions and Deriving Curriculum Outcomes:**

- Vision and Mission of the programme were framed.
- The role of Diploma holder as a technician on the job is analysed in the four 'Program Educational Objectives (PEO)' mapped with mission of the Department.
- The Program Outcomes (PO) suggested by NBA is incorporated with proper thought and understanding and two 'Program Specific Outcomes (PSO)' were defined after discussion with stake holders.
- Course Outcomes (CO) for each course is meticulously defined and mapped with POs and PSOs
- The courses common to several programmes and the courses relevant to particular programmes were classified under various categories.
- The overall course structure and Teaching Examination Scheme was prepared.
- The contents of various courses were finalised by considering the feedback from stake holders through interviews, and discussions.
- The course structure and the contents were validated by the Board of Studies.
- Study of the Diploma programmes offered by MSBTE, other State Boards and other Autonomous Institutions was done to widen the perspective.

## **6. Evolving the teaching learning process:**

The following points were considered:

- No. of weeks – 16
- Average days per week- 5.5
- No. of contact hours per day – 7
- No. of hours per week for instruction and pre-decided Co-curricular activities – 38.
- Each course shall be taught for sixteen weeks.

## **7. Course Categories:**

- Foundation (1)
- Allied (2)
- Core (3)
- Applied (4)
- Specialised (5)
- Number of courses for a programme – 36.
- Number of courses for award of class – 11
- Number of Elective courses – 3
- Number of credits to be earned for obtaining Diploma – 191.
- One credit = one hour of lecture or one hour of practical per week for a course.
- Ratio of theory to practical hours per week : approx. 55:45

## **8. Examination scheme:**

- Theory paper – 80 marks
- Tests – 20 marks
- Term Work – 25 - 100 marks
- Practicals - 25 – 50 marks
- Viva voce - 25 – 75 marks
- Project Work - 100 + 50 marks
- Grand total – 4700 marks
- Grand total of marks for award of class – 1700.

## **9. Course-wise content detailing:**

- For finalisation of course structure from Courses Committee, Examination Committee and Board of Studies, various processes in the Curriculum Revision Model were followed. Also the documents of MSBTE and Autonomous Polytechnics were referred.
- Contents were decided by taking into consideration, the expectations of the stake holders, specific needs of Industry, Interviews, Discussions and Experts opinions.
- Every course has a unique code e.g. R18EX3502. 'R18' means the course is from the curriculum revised in 2018. EX implies Electronics & Telecommunication Engineering Department will teach this course. '3' indicates that it is Core Course Category in the programme structure. '5' means the course is to be taught by

Electronics & Telecommunication Engineering programme. '02' is the serial number of the course in Core Courses Category.

The 7<sup>th</sup> character in the above 9 digit code is assigned for the programme, e.g. 1 – Civil, 2 – Mechanical, 3 – Electrical, 4 – Computer and 5 – Electronics & Telecommunication Engineering and 7 – Common courses for all programmes taught by Science Department.

- A rationale giving the importance of the course in the curriculum is vividly explained. The proficiency expected to be developed through the course is defined. The course outcomes are derived indicating the purpose to teach the course.
- The practical's, student activities, assignments & tutorials are spelt out along with assessment technique in form of Rubrics.
- The inputs for student activities are included in most of the courses so that the students will be able to learn the contents beyond syllabus.
- The curriculum document prescribes learning resources for students e.g. Reference books, Textbooks, Websites, Handbooks, Printed notes etc.
- Use of Learning Management System, Audio Visual Aids be increased for enhancing the Teaching Learning Process.

#### **10. Curriculum implementation strategy:**

- Members of the faculty shall continuously undergo Induction Training Programme, Content upgrading programme conducted by ISTE, NITTTR and other Organisations.
- The faculty members will be deputed to attend Refresher courses and Training programmes so as to help them keep abreast with latest developments and technology.
- Faculty members will be trained/ updated in respect of various aspects and methods of evaluation systems, paper setting etc.
- Faculty will be trained/updated for monitoring the curriculum implementation.
- Library will be constantly modernised with additions of latest titles and books .The Library will have open access to the students. Library will be open for extended hours. The Books Bank Facility will support the demand of the students.
- The Laboratory and Field Manuals will be structured and standardised so that the students can spend more time for doing practical's, understanding the significance, discussions and result analysis rather than only writing the journals.
- The Examination rules will be revised to suit the curriculum and will have similarity as regards to principles followed by MSBTE and other Examination bodies.
- The Evaluation Systems and marking schemes will be commensurate with the input hours and importance of the topics in the course.
- 24 X 7 – 50 MBPS internet connection is available for faculty, staff and students. Also Wi-Fi connectivity provided in all classrooms and laboratories will support the modern methods of teaching.
- Uninterrupted Power Supply and captive power is made available to take over the load shedding.
- The laboratories, equipments and computers be maintained in working conditions. The charts and exhibits be displayed to invite attention of the students.
- Industrial visits, Study tours shall be arranged regularly in a pre-planned and structured manner so as to have focus on technical aspects.

- Guest faculty should be invited to deliver lectures on recent trends, technologies, and Control processes. These activities be planned in the beginning of the term.
- The students should imbibe various life skills, soft skills, learn stress management and adjust help and appreciate colleagues especially during group activities, study tours and visits etc.

# Cusrow Wadia Institute of Technology, Pune 1.

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## **Vision and Mission of the Institute**

### **Vision**

To be a resourceful institute that develops technically competent and socially responsible citizen for futuristic needs of industry and society.

### **Mission**

**M1:** To impart technical knowledge and skills along with ethical and social values.

**M2:** To continually enhance curricula and learning resources as per latest trends in technology.

**M3:** To develop the faculty and enable them to implement innovative teaching methods.

**M4:** To strengthen association with industry and alumni.

**M5:** To adopt and implement various e-governance practices for benefits of stake-holders.

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## **Vision and Mission of the Electronics and Telecommunication Engineering Department**

### **Vision**

“To be a leading department that excels in academics to meet the needs of industry and society.”

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### **Mission**

**M1.** To impart technical education through continually enhanced learning resources.

**M2.** To empower all stakeholders with strong foundation for life- long learning

**M3.** To strengthen moral values through activities directed towards social needs



# **Cusrow Wadia Institute of Technology, Pune 1.**

## **DIPLOMA PROGRAMME IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING**

### **Rationale:**

The program is well equipped with a good understanding of Electronics Systems design techniques and their applications in area such as control, telecommunication and consumer products. The program emphasizes analytical methods to plan and design networks to meet the goals of quality, reliability and cost. The students will also develop skills enabling to exercise independent, critical and creative thought also self-confidence and maturity to be successful in their later career.

The diploma programme in Electronics & Telecommunication Engineering provides students with a strong theoretical & practical background in both hardware & software aspects of Digital Communication Systems, Mechatronics, Microprocessors Based System and Computer Based Systems along with the engineering analysis, design and implementation skills necessary to work in team. The curriculum is based on an engineering philosophy.

### **Outcomes of Electronics & Telecommunication Engineering programme**

The outcomes of Electronics & Telecommunication Engineering programme is achieved through a balance of required courses and judicious choices of technical electives and broad coverage of topics in Electronics and Telecommunication to give excellent foundation for career growth and also gives opportunity of putting the learning into practice.

The main outcomes of Electronics & Telecommunication Engineering programme are:

- The students will learn the professional studies in all years to develop practical and career skills such as teamwork, communication, presentation and project management.
- The student acquire in depth knowledge of the components and systems that make the global telecommunications network, starting with basis in Electronics and Computing.
- The students will learn about the media and devices that transport & direct communication signals through the network.
- The students will become familiar with current technology and develop the tools they will need to work with future technology.
- The students will also learn about the policies and regulations that have shaped the industry around the world.
- The students will use the workstations for designing and testing electronic circuits and for creating modern programmable intelligent electronic system applications.

## **Electronics & Telecommunication Engineering Department:**

The department was established and started functioning in the year 1951. In the recent era of globalization Electronic Communication is playing a vital role and undoubtedly playing a major source of development. There is vast scope for jobs for the students of Electronics and Telecommunication Engineering in reputed industries in India and abroad, especially in communication field.

The department is having fully equipped laboratories as per DTE and AICTE norms, covering total range of sophisticated equipments, machines, instruments, computers and software. The department is involved in student's centred activities like Personality Development, Industrial Tours, Guest Lectures and Social Activities.

Department has Laboratories namely Basic Electronics Labs, Digital Electronics and Microprocessors Lab, Software Lab. Mechatronics Lab, Microwave and Communication Lab, Power Electronics Lab, Mobile communication lab and Project Lab.

- More than 20 dual trace CRO (30MHz)
- More than 15 Digital Storage Oscilloscopes (50 MHz)
- More than 60 Branded Computers with higher end specifications.
- Internet facilities (24x7) including Wi-Fi Facility
- Simulation and software lab e quipped with application software's.
- Smart Television, Video Camera, LED, LCD, Television & VCR Trainer kits.
- Various projects are undertaken in the department based on Microcontroller, Security Systems, Industrial Automations, Telecommunication
- Well equipped software laboratory with Core i-III computers with secured network.
- Devoted and highly qualified staff.
- Departmental Library Facility.

## **Program Educational Objectives (PEOs)**

**PEO 1:** To apply the acquired knowledge of basic sciences and mathematics in solving electronics and telecommunication engineering problems.

**PEO 2:** To build strong academic foundation and develop effective communication skills to meet industrial and social needs.

**PEO 3:** To inculcate team spirit, professional ethics and environmental awareness to prepare students for lifelong learning and entrepreneurship.

## Program Outcomes (POs)

**PO1:** Basic and Discipline specific knowledge - Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

**PO2:** Problem analysis - Identify and analyse well-defined engineering problems using codified standard methods.

**PO3:** Design/development of solutions - Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

**PO4:** Engineering Tools, Experimentation and Testing - Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

**PO5:** Engineering practices for society, sustainability and environment - Apply appropriate technology in context of society, sustainability, environment and ethical practices.

**PO6:** Project Management - Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

**PO7:** Life-long learning - Ability to analyse individual needs and engage in updating in the context of technological changes.

## Program Specific Outcomes (PSOs)

**PSO1:** Demonstrate basic analog and digital electronic circuits using modern electronic tools.

**PSO2:** Troubleshoot and monitor specified electronic system.

## Matrix of PEOs and Mission of the Department

--	Department Mission			Total	% Co-relation
	M1	M2	M3		
<b>PEO 1</b>	3	3	1	7	35%
<b>PEO 2</b>	2	3	3	8	40%
<b>PEO 3</b>	1	2	2	5	25%
Total	6	8	6	20	100
% Co-relation	30%	40%	30%	100	

- PEO1 strongly supports mission1, mission 2 and weakly support mission 3.
- PEO1 is correlates strongly with mission 1 and 2 as emphasis on Knowledge of fundamentals to solve technical problems in electronics and telecommunications and its allied field with the use of EDA
- (Electronic Design Automation) tools are imparted to the students through programme to expand their knowledge horizon.

- PEO1 correlates weakly with mission3 as application of fundamentals develops the technical abilities.
- PEO2 Moderately support mission1 & strongly supports mission 2 and 3.
- PEO2 is correlates moderately with mission 1 and strongly with the mission 2 and 3. This is because various skills like effective communication, leadership, team building, problem solving, decision making skills, and software skills by understanding contemporary issues there by contributing to their making skills and software skills are developed through understanding contemporary issues their by contributing to their overall personality and career development through higher education.
- PEO3 weakly support mission1, it moderately support mission 2 and 3.
- PEO3 correlates moderately with mission 2 and 3 as the perception of abilities like practicing ethical responsibilities and services towards their peers, employers and society prepares the students for better and ethical lifelong learning.
- PEO3 weakly supports mission 1 as application of fundamentals develops the technical abilities.

**CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE-1.**  
**PROGRAMME: DIPLOMA IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**SCHEME: MPECS 2018**

OVERALL SUMMARY											
SR. NO.	CATEGORY	NO. OF COURSES		TEACHING SCHEME			EXAMINATION SCHEME				
		COMP.	OPT.	L	P	CREDITS	TH + TT	PR	OR	TW	TOTAL
1	Foundation	10	-	27	22	49	600	-	75	325	1000
2	Allied	3	1	11	05	16	200	-	50	75	325
3	Core	7	-	28	16	44	700	150	50	350	1250
4	Applied	12	-	27	34	61+6 <sup>^</sup>	600	175	250	500	1525
5	Specialized	-	3	09	06	15	300	150	-	150	600
<b>TOTAL</b>		32	4	102	83	185+6 <sup>^</sup>	2400	475	425	1400	4700
(^): Six weeks industrial training is compulsory after fourth semester (i.e May to June). Though 6 credits are allocated for <u>Industrial Training</u> . It is only for awarding marks. As far as teaching load/time table preparation is considered, each faculty would be assigned with one batch of students (equivalent to practical batch size) for guiding the preparation of industrial training report and its evaluation. For this purpose 1 hour (or two hours on working Saturdays) teaching load would be considered.											

Total No. of Courses to be Completed=35+01^; Compulsory Courses=32+ Optional Courses=4

No. of Courses having Theory Exam =24

No. of Practical + Oral Examination = 11 +09 =20

Credit Ratio ; Theory : Practical = 55 : 45

Marks Ratio ; Theory : PR+OR+TW = 51 : 49

## CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE-1.

PROGRAMME: DIPLOMA IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING

SCHEME: MPECS 2018

### FOUNDATION COURSES

Category : FOUNDATION														
Sr. No.	Course Code	Course Title	Preq.	C/O	L	P	TU	CR	TH	TT	PR	OR	TW	TOTAL
1.	R18SC1701	Basic Mathematics		C	4	-	1	5	80	20	-	-	-	100
2.	R18SC1710	Engineering Mathematics		C	4	-	1	5	80	20	-	-		100
3.	R18SC1704	Basic Science(B.Phy +B.Chem)		C	4	4	-	8	80 (40+40)	20 (10+10)	-	-	50 (25+25)	150
4.	R18SC1707	English		C	2	2	-	4	80	20	-	-	25	125
5.	R18SC1708	Business Communication		C	1	2	-	3	-	-	-	@25	25	50
6.	R18SC1709	Applied Science (E.Phy.+E.Chem.)		C	4	4	-	8	80	20	-	-	50	150
7.	R18EX1501	Electronics Lab Practice I		C	2	2	-	4	-	-	-	@50	50	100
8.	R18EX1502	Fundamental of Programming		C	4	2	-	6	80	20	-	-	25	125
9.	R18ME1204	Engineering Graphics Skills		C	2	2	-	4	-	-	-	-	50	50
10.	R18ME1205	Workshop Practice		C	-	2	-	2	-	-	-	-	50	50
Total					27	20	2	49	480	120	-	75	325	1000

@ Internal Assessme

**CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE-1.**  
**PROGRAMME: DIPLOMA IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**SCHEME: MPECS 2018**  
**ALLIED COURSES**

Category : ALLIED														
Sr. No.	Course Code	Course Title	Preq.	C/O	L	P	TU	CR	TH	TT	PR	OR	TW	TOTAL
1.	R18EE2304	Electrical Engineering		C	3	2	-	5	80	20	-	-	25	125
2.	R18EX2501	Renewable energy and Environmental Technology		C	2	2	-	4	-	-	-	@25	25	50
3.	R18EX2502	Entrepreneurship Development Program		O	2	1	-	3	-	-	-	@25	25	50
	R18EX2503	Elements of Accounts and Finance			2	-	1							
4.	R18EX2504	Industrial Organization and Management		C	4	-	-	4	80	20	-	-	--	100
Total					11	05	-	16	160	40	-	50	75	325

@ Internal Assessment      N. B. – Term work for all the courses shall be assessed internally



# CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE-1.

PROGRAMME: DIPLOMA IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING

SCHEME: MPECS 2018

## CORE COURSES

Category : CORE														
Sr. No.	Course Code	Course Title	Preq.	C/O	L	P	TU	CR	TH	TT	PR	OR	TW	TOTAL
1.	R18EX3501	Network Theory		C	4	2	-	6	80	20	-	-	50	150
2.	R18EX3502	Semiconductor Devices and Circuits		C	4	2	-	6	80	20	@25	-	50	175
3.	R18EX3503	Digital Electronics		C	4	2	-	6	80	20	-	25	50	175
4.	R18EX3504	Communication System I		C	4	4	-	8	80	20	@50	-	50	200
5.	R18EX3505	Linear Integrated Circuits		C	4	2	-	6	80	20	-	@25	50	175
6.	R18EX3506	Communication System II		C	4	2	-	6	80	20	50	-	50	200
7.	R18EX3507	Electronic Measurement		C	4	2	-	6	80	20	25	-	50	175
<b>Total</b>					<b>28</b>	<b>16</b>	<b>-</b>	<b>44</b>	<b>560</b>	<b>140</b>	<b>150</b>	<b>50</b>	<b>350</b>	<b>1250</b>

\*Includes marks for tutorial

@ Internal Assessment

N. B. – Term work for all the courses shall be assessed internally

# CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE-1.

PROGRAMME: DIPLOMA IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING

SCHEME: MPECS 2018

## APPLIED COURSES

Category : APPLIED

Sr. No.	Course Code	Course Title	Preq.	C/O	L	P	TU	CR	TH	TT	PR	OR	TW	TOTAL
1.	R18EX4501	Applied Electronics		C	4	4	-	8	80	20	50	-	50	200
2.	R18EX4502	Electronics Lab Practice II		C	-	4	-	4	-	-	-	50	50	100
3.	R18EX4503	Power Electronics		C	4	2	-	6	80	20	25	-	25	150
4.	R18EX4504	Microcontroller And Interfacing Devices		C	4	4	-	8	80	20	25	-	25	150
5.	R18EX4505	Consumer Electronics		C	4	4	-	8	80	20	-	@25	25	150
6.	R18EX4506	Control System		C	3	2	-	5	80	20	-	-	-	100
7.	R18EX4507	Circuit Simulation Lab		C	2	2	-	4	-	-	@50	-	25	75
8.	R18EX4508	Embedded System	(R18EX 4504)	C	4	4	-	8	80	20	25	-	25	150
9.	R18EX4509	Mini Project And Seminar		C	-	2	-	2	-	-	-	@50	50	100
10.	R18EX4510	Main Project		C	-	4	-	4	-	-	-	50	100	150
11.	R18EX4511	Industrial Training (during summer break after IV semester)		C	-	-	-	6^	-	-	-	75	75	150
12.	R18EX4512	Avionics		C	2	2	-	4	-	-	-	-	50	50
		<b>Total</b>			<b>27</b>	<b>34</b>	<b>-</b>	<b>61+6^</b>	<b>480</b>	<b>120</b>	<b>175</b>	<b>250</b>	<b>500</b>	<b>1525</b>

(^): Six weeks industrial training is compulsory after fourth semester (i.e May to June). Though 6 credits are allocated for Industrial Training. It is only for awarding marks. As far as teaching load/time table preparation is considered, each faculty would be assigned with one batch of students (equivalent to practical batch size) for guiding the preparation of industrial training report and its evaluation. For this purpose 1 hour (or two hours on working Saturdays) teaching load would be considered.

@ Internal Assessment

**CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE-1.**  
**PROGRAMME DIPLOMA IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**SCHEME: MPECS 2018**  
**SPECIALISED COURSES**

Category : SPECIALIZED														
Sr. No.	Course Code	Course Title	Preq.	C/O	L	P	TU	CR	TH	TT	PR	O R	TW	TOTAL
1.	R18EX5501	Optical And Microwave Communication	(R18EX3504)	O	3	2	-	5	80	20	50	-	50	200
	R18EX5502	Satellite and Radar Communication												
2.	R18EX5503	Industrial Automation	(R18EX4501)	O	3	2	-	5	80	20	50	-	50	200
	R18EX5504	Mechatronics												
3.	R18EX5505	Network Communication	(R18EX3504)	O	3	2	-	5	80	20	50	-	50	200
	R18EX5506	Wireless Communication												
Total					09	06	-	15	240	60	150	-	150	600

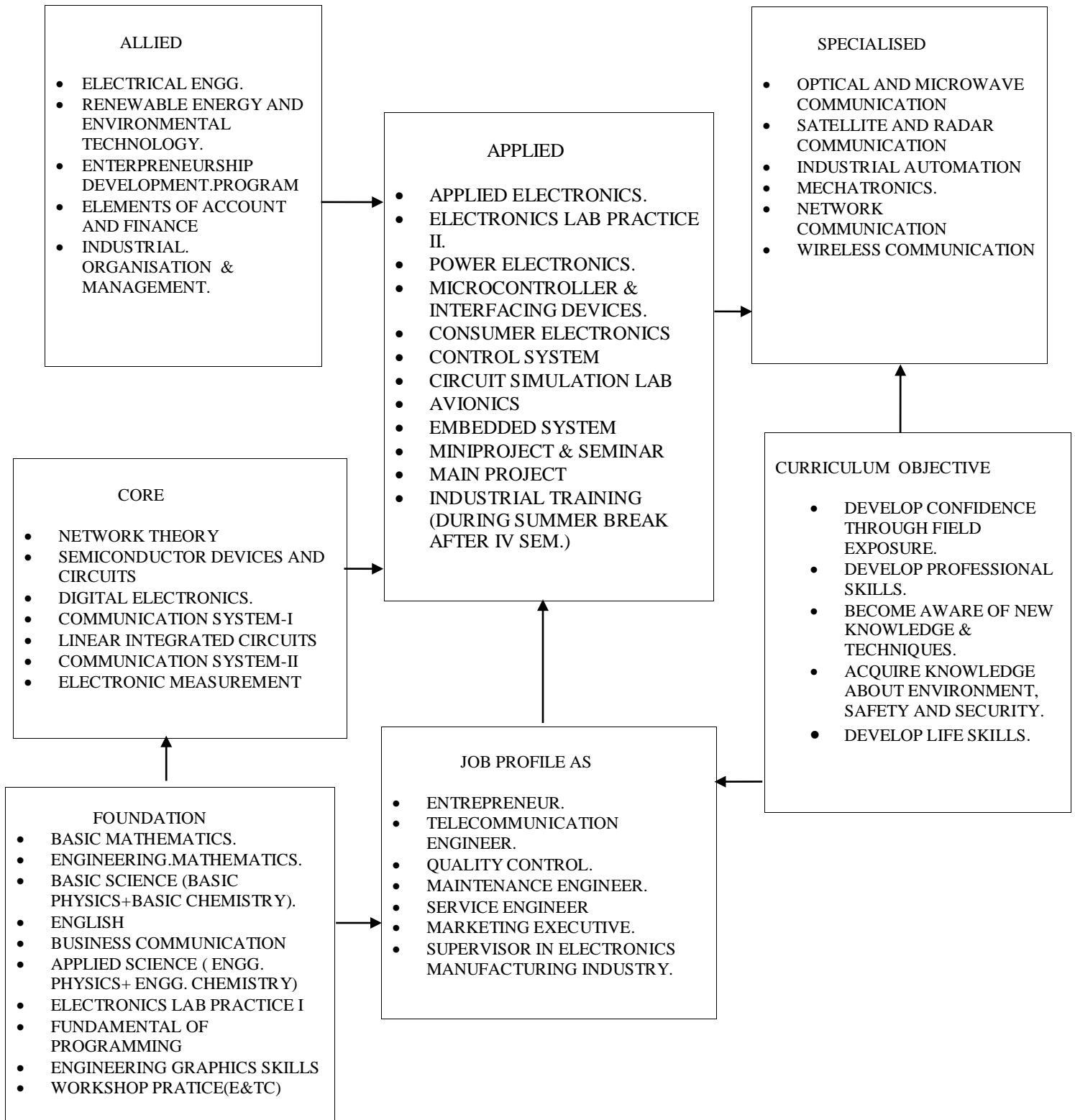
@ Internal Assessment

N. B. – Term work for all the courses shall be assessed internally

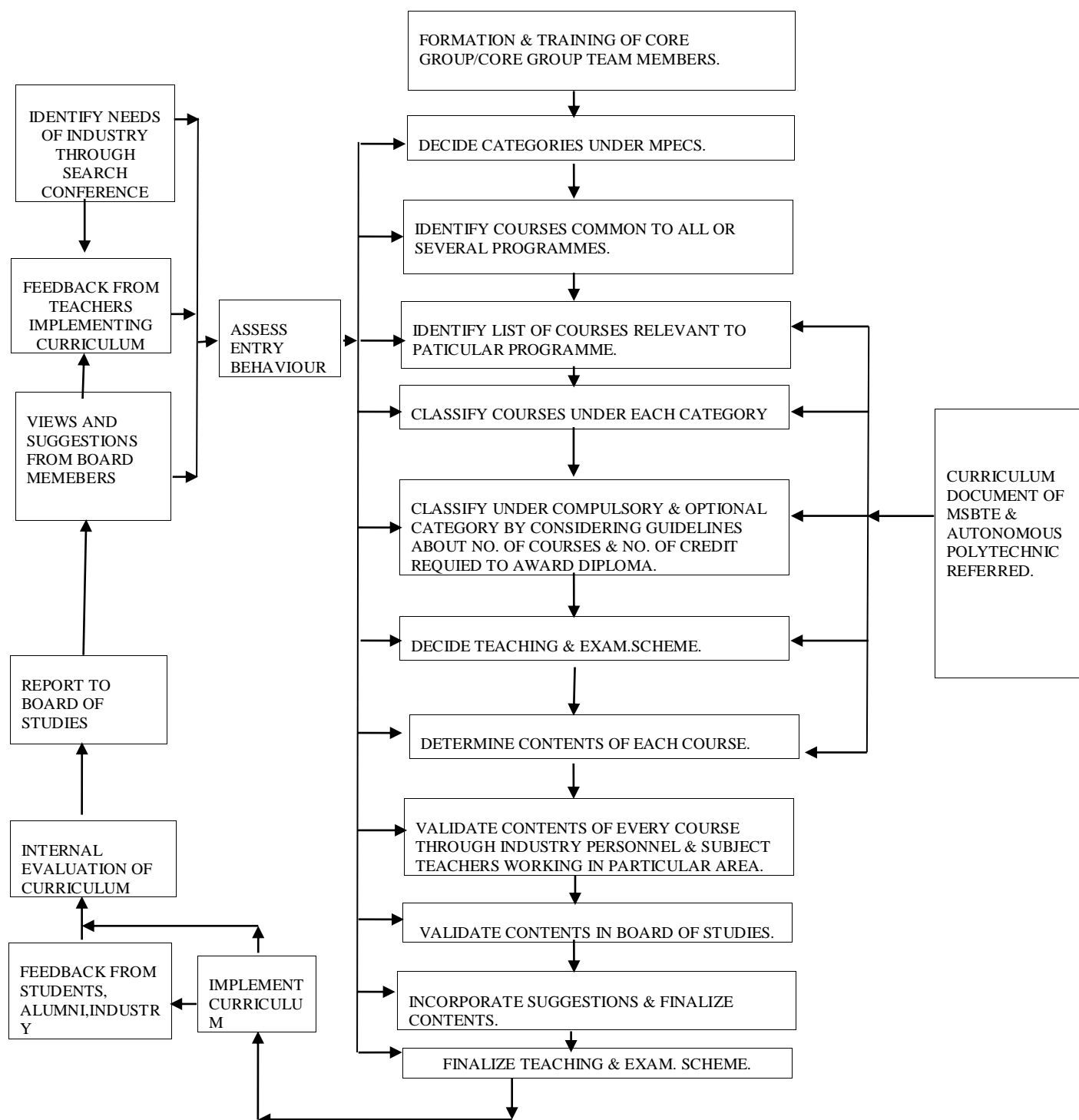
**CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE-1.**  
**PROGRAMME DIPLOMA IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**SCHEME: MPECS 2018**  
**CLASS DECLARATION COURSES**

<b>CLASS DECLARATION</b>															
<b>Sr.No</b>	<b>Category</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Preq</b>	<b>C/O</b>	<b>L</b>	<b>P</b>	<b>TU</b>	<b>CR</b>	<b>TH</b>	<b>TT</b>	<b>PR</b>	<b>OR</b>	<b>TW</b>	<b>Total</b>
1.	Allied	R18EX2504	Industrial Organization and Management		C	4	-	-	4	80	20	-	-	-	100
2.	Applied	R18EX4506	Control System		C	3	2	-	5	80	20	-	-	-	100
3.		R18EX4503	Power Electronics		C	4	2	-	6	80	20	25	-	25	150
4.		R18EX4504	Microcontroller And Interfacing Devices		C	4	4	-	8	80	20	25	-	25	150
5.		R18EX4505	Consumer Electronics		C	4	4	-	8	80	20	-	@25	25	150
6.		R18EX4508	Embedded System	(R18EX4504)	C	4	4	-	8	80	20	25	-	25	150
7.	Specialized	R18EX5501	Optical And Microwave Communication		C	3	2	-	5	80	20	50	-	50	200
		R18EX5502	Satellite and Radar Communication												
8.		R18EX5503	Industrial Automation	(R18EX4501)	O	3	2	-	5	80	20	50	-	50	200
		R18EX5504	Mechatronics												
9.		R18EX5505	Network Communication	(R18EX3504)	O	3	2	-	5	80	20	50	-	50	200
		R18EX5506	Wireless Communication												
10.	Applied	R18EX4510	Main Project	100CR	C	-	4	-	4	-	-	-	50	100	150
11.	Applied	R18EX4511	Industrial Training		C	-	-	-	6^	-	-	-	75	75	150
<b>TOTAL</b>						<b>32</b>	<b>26</b>	<b>-</b>	<b>58+6^</b>	<b>640</b>	<b>160</b>	<b>250</b>	<b>175</b>	<b>475</b>	<b>1700</b>
<b>Theory Marks = 800      PR +OR+TW Marks = 750      Industrial Training=150</b>															

## LINK DIAGRAM FOR ELECTRONICS & TELECOMMUNICATION ENGINEERING



## CURRICULUM REVISION MODEL USED AT CWIT-2018



**CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE-1.**  
**PROGRAMME DIPLOMA IN ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**SCHEME: MPECS 2018**  
**INDEX**

Sr. No.	Category		Course Code	Course Title (Abbreviation)	Page No.
1	Foundation		R18SC1701	Basic Mathematics	01
2			R18SC1710	Engineering Mathematics	06
3			R18SC1704	Basic Science (B.Phy + B.Chem)	11
4			R18SC1707	English	20
5			R18SC1708	Business Communication	26
6			R18SC1709	Applied Science (E.Phy. + E.Chem.)	30
7			R18EX1501	Electronics Lab Practice I	38
8			R18EX1502	Fundamental of Programming	42
9			R18ME1204	Engineering Graphics Skills	49
10			R18ME1205	Workshop Practice	54
11	Allied		R18EE2304	Electrical Engineering	58
12			R18EX2501	Renewable energy and Environmental Technology	64
13			R18EX2502	Entrepreneurship Development Program	68
			R18EX2503	Elements of Accounts and Finance	73
14			R18EX2504	Industrial Organization and Management	77
15	Core		R18EX3501	Network Theory	84
16			R18EX3502	Semiconductor Devices and Circuits	90
17			R18EX3503	Digital Electronics	96
18			R18EX3504	Communication System I	105
19			R18EX3505	Linear Integrated Circuits	113
20			R18EX3506	Communication System II	119
21			R18EX3507	Electronic Measurement	126
22	Applied		R18EX4501	Applied Electronics	131
23			R18EX4502	Electronics Lab Practice II	139
24			R18EX4503	Power Electronics	144
25			R18EX4504	Microcontroller And Interfacing Devices	152
26			R18EX4505	Consumer Electronics	158
27			R18EX4506	Control System	165
28			R18EX4507	Circuit Simulation Lab	170
29			R18EX4512	Avionics	174
30			R18EX4508	Embedded System	178
31			R18EX4509	Mini Project And Seminar	184
32			R18EX4510	Main Project	188
33			R18EX4511	Industrial Training (during summer break after IV semester)	192
34	Specialized	I	R18EX5501	Optical And Microwave Communication	195
			R18EX5502	Satellite and Radar Communication	201
35		II	R18EX5503	Industrial Automation	207
			R18EX5504	Mechatronics	212
36		III	R18EX5505	Network Communication	217
			R18EX5506	Wireless Communication	223

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: CIVIL/MECH./ELECT./COMP./E&TC. ENGINEERING**  
**COURSE: BASIC MATHEMATICS** **COURSE CODE : R18SC1701**  
**COURSE CATEGORY : FOUNDATION** **CREDIT : 5**

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**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme						
TH	PR	TU	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	-	1	3	80	20	-	-	-	100

**Rationale:**

Mathematics is an important prerequisite for the development and understanding of engineering concepts. The aim of the course is to acquire some essential competencies in Mathematics by the students of diploma in Engineering. The course will help the students to think logically and systematically. The students will develop the attitude of problem solving. Hence the course provides the ability to analyze Engineering problems using determinants, matrices, trigonometry, statistics and graphs.

**Course Outcomes:**

1. Apply the rules and formulae of trigonometry to solve engineering problem.
2. Use determinant and matrices to solve simultaneous equations for engineering problem.
3. Analyze the given data using measures of central tendency and dispersion.
4. Plot the graph of functions used in Engineering field.

**Course Details:**

The following topics/subtopics should be taught and assessed in order to develop **UOs** in cognitive domain for achieving the COs .

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
Unit 1 <b>Trigonometry</b>	1.1 Trigonometric ratios of an angle Definition of positive and negative angles. Unit of measurement of an angle. Signs of trigonometric ratios of an angle in the four quadrants.(ASTC RULE) Trigonometric ratios of negative angles. 1.2 Trigonometric ratios of compound and allied angles. 1.3 Trigonometric ratios of multiple	1a. Apply the concept of Compound angle, allied angle, and multiple angles to solve the given simple engineering problem(s). 1b. Apply the concept of Sub- multiple angle to solve the given simple engineering related problem(s).	12	12



	and sub-multiple angles.			
Unit 2 <b>Trigonometry</b>	2.1 Factorization and de-factorization formulae. 2.2 <b>Inverse Circular function</b> Definition of inverse circular function. Principal value of inverse circular function. Properties of inverse circular function.	2a. Apply concept of factorization and de-factorization formulae to solve the given simple engineering problem(s). 2b. Investigate given simple problems utilizing inverse trigonometric ratios.	10	<b>12</b>
Unit 3 <b>Algebra</b>	<b>3.1 Determinant:</b> Definition of determinants. Problems on expansion of determinants of order 3. Solution of simultaneous equation in three unknowns (Cramer's Rule). <b>3.2 Partial Fractions:</b> Definition of fraction, proper and improper fraction. Resolve the given proper fraction into partial fraction for the cases a. Factors of denominator are linear and non-repeated b. Factors of denominator are linear but repeated. c. Factors of denominator are quadratic, non-repeated and irreducible	3a. Calculate the area of the given triangle with vertices A, B, C using determinant. 3b. Solve the system of linear equations using determinant method for given simple engineering problem. 3c. Resolve the given proper fraction into partial fractions.	14	16
UNIT 4 <b>Matrices</b>	<b>Matrices:</b> 4.1 Definition of a Matrix. Types of Matrices. 4.2 Algebra of matrices: Addition, subtraction and multiplication of matrices. 4.3 Transpose of a matrix. Adjoint of a matrix. Inverse of a matrix by adjoint method. 4.4 Solution of simultaneous equation by matrix method.	4a. Solve the system of linear equations using matrix method and determinant method for given simple engineering problem.	12	16
Unit 5 <b>Statistics</b>	<b>Measures of dispersion:</b> 5.1 Mean deviation about mean of raw, ungrouped and grouped data. 5.2 Standard deviation of raw, ungrouped and grouped data. 5.3 Variance and coefficient of variation. 5.4 Comparison of two sets.	5a. Calculate the mean deviation of the given statistical observations of an experiment 5b. Calculate the standard deviation, variance and coefficient of variation of the given data 5c. Justify the consistency of	8	12

		the given simple sets of data		
<b>Unit 6 Functions</b>	<b>6.1 Functions and Limits:</b> Definition of functions and Notation. Different types of functions. Limits -Concept of limits <b>6.2 Graphs:</b> Graph of linear function. Graph of quadratic equation. Graph of trigonometric function. Graph of exponential function.	6a. Find the value of the given function 6b. Plot the graph of the given simple function	8	12

### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Trigonometry	12	2	4	6	12
2	Trigonometry	10	2	4	6	12
3	Algebra	14	4	4	8	16
4	Matrices	12	4	4	8	16
5	Statistics	8	-	6	6	12
6	Functions	8	2	4	6	12
	<b>Total</b>	<b>64</b>	14	26	40	<b>80</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Tutorials	Appro. Hrs. Required
1	3	Solve problems on determinant to find area of triangle, and solution of simultaneous equation by Cramer's Rules.	1
2	4	Solve elementary problems on Algebra of matrices.	1
3	4	Solve elementary problems on Algebra of matrices.	1
4	4	Solve solution of Simultaneous Equation using inversion method.	1
5	3	Resolve into partial fraction using linear non repeated, repeated linear factors.	1

S. No.	Unit No.	Tutorials	Appro. Hrs. Required
6	3	Resolve into partial fraction using quadratic, irreducible factors.	1
7	1	Solve problems on Compound and Allied angles	1
8	1	Solve problems on multiple and sub-multiple angles	1
9	2	Practice problems on factorization and de factorization formula	1
10	1&2	Solve problems on trigonometry (All mixed)	1
11	2	Solve problems on inverse circular trigonometric ratios.	1
12	5	Solve problems on finding mean deviation about mean.	1
13	5	Solve problems on standard deviation.	1
14	5	Solve problems on coefficient of variation, comparison of two sets.	1
15	6	Solve problems on functions	1
16	6	Plot the graph of the given function	1
<b>Total</b>			<b>16</b>

### SUGGESTED STUDENT ACTIVITIES

1. Identify engineering problems based on real world problems and solve with the use of free tutorials available on the internet.
2. Use graphical software: EXCEL, DPLLOT and GRAPH for related topics.
3. Prepare a seminar on any relevant topic.

### SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- I. Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- II. '**L**' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- III. About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the **UOs/COs** through classroom presentations

## SUGGESTED LEARNING RESOURCES

### A) Books

Sr. No.	Title of Book	Author	Publication
1	Higher Engineering Mathematics	Grewal, B.S.	Khanna publications, New Delhi, 2015 ISBN: 8174091955
2	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publications, New Delhi, 2014 <a href="#">ISBN :978-0-470-45836-5</a>
3	Engineering Mathematics (third edition).	Croft, Anthony	Pearson Education, New Delhi, 2014 ISBN 978-81-317-2605-1
4	Advanced Engineering Mathematics	Das, H.K.	S. Chand & Co.; New Delhi; 2008, ISBN-9788121903455

### B) Major Equipment/ Instrument with Broad Specifications

### C) Software/Learning/ [Simulations](#) Websites

[www.dplot.com/](http://www.dplot.com/) - DPlot

[www.allmathcad.com/](http://www.allmathcad.com/) - MathCAD

[www.wolfram.com/mathematica/](http://www.wolfram.com/mathematica/) - Mathematica

<https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaAoddHoPig>

[www.easycalculation.com](http://www.easycalculation.com)

[www.math-magic.com](http://www.math-magic.com)

### Mapping matrix of PO's and CO's: (with Justification of each cell)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	2	1	-	-	-	1	-	-
CO2	3	2	1	-	-	-	1	-	-
CO3	3	2	1	-	-	-	1	-	-
CO4	3	2	1	-	-	-	1	-	-

### 3: High 2: Moderate and 1:Low Relationship

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECT/COMP/E&TC ENGINEERING**

**COURSE: ENGINEERING MATHEMATICS**

**COURSE CODE: R18SC1710**

**COURSE CATEGORY : FOUNDATION**

**CREDIT : 5**

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**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme						
TH	PR	TU	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	-	1	3	80	20	-	-	-	100

**Rationale:**

Mathematics is an important prerequisite for the development and understanding of engineering concepts. The subject intends to teach students basic facts, concepts and principles of Mathematics as a tool to analyze engineering problems. It also aims to teach students to apply the basic facts of Mathematics to solve engineering problem.

**Competency:**

The aim of the course is to help the students to attain the following industry identified competency through various teaching learning experiences:

**Solve broad-based technology problems using the principles of Engineering Mathematics for Electrical, Computer and Electronics and Telecommunication Engineering.**

**Course Outcomes:**

1. Apply the rules and methods of derivatives to engineering field.
2. Evaluate integration of a function as anti derivative.
3. Apply appropriate methods of integration to engineering problem.
4. Apply appropriate methods of differential equation to engineering problems.
5. Convert the given complex number to its polar form.

**Course Details:**

UNIT	NAME OF THE TOPIC (with Details)	LEARNING OUTCOME	HOUR S	MAR KS
Unit 1 <b>Derivatives</b>	<b>Derivatives:</b> 1.1 Concept and definition of derivative. Derivatives of standard functions. 1.2 Laws of derivatives :- Addition law. Subtraction law. Multiplication law. Division law.	1a. olve the given simple problems based on rules of differentiation.	8	12

Unit 2 <b>Derivatives</b>	<p>2.1 Derivatives of composite functions (Chain rule) <b>Methods of Derivatives:</b></p> <p>2.2 Derivative of parametric functions.</p> <p>2.3 Derivative of implicit functions. Concept of higher order derivatives</p>	<p>2a. Solve the given problems of differentiation for composite functions.</p> <p>2b. Solve the given problems of Differentiation for parametric and implicit functions.</p>	12	12
Unit 3 <b>Integration</b>	<p><b>Integration</b></p> <p>3.1 Definition of integration as anti-derivative.</p> <p>3.2 Integration of algebraic functions.</p> <p>3.3 Integration by substitution.</p> <p>3.4 Integration by parts.</p> <p>3.5 Integration by partial fraction</p>	<p>3a. Obtain the given simple integral(s) using substitution method.</p> <p>3b. Integrate given simple functions using the integration by parts.</p> <p>3c. Evaluate the given simple integral by partial fractions.</p>	16	16
Unit 4 <b>Application of Derivatives &amp; Integration</b>	<p><b>Application of Derivatives:</b></p> <p>4.1 Geometrical meaning of derivative. (slope of tangent and normal to the given curve)</p> <p>4.2 Maxima and minima using derivative.</p> <p><b>Application of Integration:</b></p> <p>4.3 Mean value of the function</p> <p>4.4 Root mean square value</p>	<p>4a. Apply the concept of differentiation to find slope of tangent and normal to the given curve.</p> <p>4b. Apply the concept of differentiation to calculate maxima and minima of given problem.</p> <p>4c. Invoke the concept of definite integration to find the mean value and RMS value of the function.</p>	8	16
Unit 5 <b>Differential Equation</b>	<p><b>Differential Equation:</b></p> <p>5.1 Definition of differential equation. Order and degree of differential equation.</p> <p>5.2 Solution of differential equation of 1<sup>st</sup> order and 1<sup>st</sup> degree. Variable separable differential equation. Linear differential equation.</p>	<p>5a. Find the order and degree of the differential equation.</p> <p>5b. Solve the differential equation using the method of variable separable for the given engineering problem.</p> <p>5c. Solve the linear differential equation for the given engineering problem.</p>	10	12
Unit 6 <b>Complex Number</b>	<p><b>Complex Number:</b></p> <p>6.1 Definition of complex number. Algebra of complex</p>	<p>6a. Solve the given problem using algebra of complex numbers.</p> <p>6b. Express the given complex number in polar form.</p> <p>6c. Find the powers of complex number</p>	10	12

	number i.e. addition, subtraction, multiplication and division of complex numbers. To express given complex number in $x + iy$ form. 6.2 Modulus and amplitude of complex number. Polar form of a complex number.	using De-Moivre's theorem.		
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### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Derivatives	8	4	8	-	12
2	Derivatives	12	-	8	4	12
3	Integration	16	4	4	8	16
4	Application of Derivatives & Integration	8	-	4	12	16
5	Differential Equation	10	4	-	8	12
6	Complex Number	10	2	2	8	12
Total		64	14	26	40	80

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Tutorials	Appro. Hrs. Required
17	1	Solve the given simple problems based on rules of differentiation.	1
18	2	Solve the given problems based on chain rule of differentiation	1
19	2	Solve the given problems of differentiation on parametric functions.	1
20	2	Solve the given problems of differentiation on logarithmic functions.	1
21	1 & 2	Solve engineering problems on differentiation.	1
22	3	Solve the given simple integral(s) as anti derivative.	1
23	3	Solve the given integral(s) using substitution method.	1
24	3	Solve the given integral(s) using integration by parts and by partial fraction.	1

S. No.	Unit No.	Tutorials	Appro. Hrs. Required
25	3	Solve engineering problems on integration.	1
26	4	Solve problems on slope of tangent and normal at given point on the curve and on finding maxima minima of function.	1
27	4	Solve problems on finding Mean value and RMS value of the function.	1
28	4	Solve engineering problems on application of differentiation and integration.	1
29	5	Find order and degree of given differential equation.	1
30	5	Solve differential equation based on variable separable and Linear differential equation.	1
31	6	Express the given complex number in $a + ib$ form and polar form.	1
32	6	Find the powers of complex number using De-Moivre's theorem.	1
<b>Total</b>			

### SUGGESTED STUDENT ACTIVITIES

1. Identify engineering problems based on real world problems and solve with the use of free tutorials available on the internet.
2. Use graphical software: EXCEL, DPLOT and GRAPH for related topics.
3. Prepare a seminar on any relevant topic based on application of integration.
4. Prepare a seminar on any relevant topic based on application of differentiation.

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- I. Massive open online courses (**MOOCs**) may be used to teach various topics/sub topics.
- II. '**L**' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- III. About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for **self-directed learning** and assess the development of the **UOs/COs** through classroom presentations

### SUGGESTED LEARNING RESOURCES

#### D) Books

Sr. No.	Title of Book	Author	Publication
5	Higher Engineering Mathematics	Grewal, B.S.	Khanna publications, New Delhi, 2015 ISBN: 8174091955
6	Advanced Engineering Mathematics	Krezig, Ervin	Wiley Publications, New Delhi, 2014 <a href="#">ISBN :978-0-470-45836-5</a>



7	Engineering Mathematics (third edition).	Croft, Anthony	Pearson Education, New Delhi, 2014 ISBN 978-81-317-2605-1
8	Advanced Engineering Mathematics	Das, H.K.	S. Chand & Co.; New Delhi; 2008, ISBN-9788121903455

**E) Software/Learning/ Simulations Websites**

[www.dplot.com/](http://www.dplot.com/) - DPlot

[www.allmathcad.com/](http://www.allmathcad.com/) - MathCAD

[www.wolfram.com/mathematica/](http://www.wolfram.com/mathematica/) - Mathematica

<https://www.khanacademy.org/math?gclid=CNqHuabCys4CFdOJaAoddHoPig>

[www.easycalculation.com](http://www.easycalculation.com)

[www.math-magic.com](http://www.math-magic.com)

**Mapping matrix of PO's and CO's:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	1	1	-	-	-	1	-	-
CO2	3	1	1	-	-	-	1	-	-
CO3	3	1	1	-	-	-	1	-	-
CO4	3	1	1	-	-	-	1	-	-
CO5	3	1	1	-	-	-	1	-	-

**3: High 2: Moderate and 1:Low Relationship**

**DIPLOMA PROGRAMME IN: CIVIL/MECH./ELECT./E&TC. ENGINEERING**

**COURSE : BASIC SCIENCE**  
**COURSE CATEGORY : FOUNDATION**

**COURSE CODE: R18SC1704**  
**CREDITS : 8**

**TEACHING AND EXAMINATION SCHEME:**

Teaching Scheme			ONLINE EXAM HRS	EXAMINATION SCHEME					
	TH	PR		TH	TEST	PR	OR	TW	TOTAL
Physics	2	2	1	40	10	-	-	25	75
Chemistry	2	2	1	40	10	-	-	25	75

**RATIONALE**

Basic Sciences like Physics and Chemistry are the pillars of engineering and technology. It is very essential to learn the basic sciences to understand the fundamental concepts and principles. The course content is chosen so that it should be more relevant to fulfil the needs of industries. The study of basic principles in Electrochemistry, Corrosion, Chemical Bonding, Heat, Electricity, Magnetism and Semi-Conductors will help in understanding the technical courses where emphasis is on application of these in various fields.

**COURSE OUTCOMES (COs)**

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

1. Estimate errors in measurements of physical quantities measured with appropriate measuring instruments.
2. Apply principles of Electricity, Magnetism and Semi-Conductors to solve engineering problems.
3. Apply Gas laws, use basic principle of Heat and Temperature to related engineering problems.
4. Identify different types of bonds of different compounds.
5. Apply concepts of Electrochemistry and Corrosion to solve engineering problems.
6. Describe Polymers, Lubricants and Adhesives.

**COURSE DETAILS:**

The following topics should be taught and assessed in order to develop UOs in cognitive domain for achieving the COs

UNIT	NAME OF THE TOPICS AND SUBTOPICS	LEARNING OUTCOMES (UOS)	HOURS	MAR KS
1	<b>1.1</b> Physical quantity, fundamental and derived physical quantity with examples. Unit of physical quantity, fundamental units with examples and derived units with examples. <b>1.2</b> System of units (C.G.S., M.K.S., F.P.S. and	<b>1a.</b> Describe the concept of given physical quantities with relevant unit of measurement. <b>1b.</b> State	9	12

<b>Units and Measurements</b>	<p>S.I.) Rules and Conventions for writing units in SI system. Tables of fundamental and derived S.I. units. Multiples and sub multiples of units. Significant figures, rules for determining the significant figures.</p> <p><b>1.3</b> Dimensions and dimensional formulae</p> <p><b>1.4</b> Errors, types of errors (Instrumental, systematic and random error) and methods for minimization of errors,</p> <p><b>1.5</b> Estimation of errors (Absolute error, average absolute error, relative error and percentage error), Propagation of errors in measurement, Numerical</p>	<p>various systems of units and its need for the measurement of the given physical quantities.</p> <p><b>1c.</b> Determine the dimensions of given physical quantities. State the error in the given measurement with justification.</p>		
<p><b>2</b></p> <p><b>Electricity, Magnetism and Semiconductors</b></p>	<p><b>2.1</b> Concept of charge, Coulomb's inverse square law, Electric field, Electric lines of force and their properties, Electric field intensity, Electric potential and potential difference, Electric flux density, Electric current, Ohm's law, Specific resistance, Resistance by using colour code, Laws of series and parallel resistance, Heating effecting of electric current, Electric power, Electric energy in kWh, Electric bill, Numerical.</p> <p><b>2.2</b> Magnetic field, magnetic field intensity and their units, Magnetic lines of force and their properties, magnetic flux.</p> <p><b>2.3</b> Conductors, semiconductors, insulators and their energy band diagrams.</p> <p><b>2.4</b> Intrinsic or pure semiconductor, extrinsic or impurity doped semiconductors, pentavalent impurity doped N-type semiconductor and trivalent impurity doped P-type semiconductor. p-n junction diode,</p>	<p>1c. Calculate electric field, potential and potential difference of the given static charge.</p> <p>1d. Describe the concept of given magnetic intensity and flux with relevant units.</p> <p>1e. Explain the heating effect of the electric current.</p> <p>1f. Apply laws of series and parallel combination in the given electric circuits.</p> <p>1g. Distinguish the given conductors, semiconductors and insulators on the basis of energy bands. Explain the I-V characteristics and applications of the given p-n junction diodes.</p>	<p><b>14</b></p>	<p><b>16</b></p>

	<b>2.5 Forward</b> and reverse biasing of p-n junction diode, I-V characteristics of p-n junction, and applications of p-n junction diode.			
<b>3</b>  <b>Heat , Temperature and Gas laws</b>	<p><b>3.1</b> Heat, units of heat, calorie-joule conversion, Latent heat and sensible heat. Temperature, Temperature scales, Absolute zero temperature, relations of temperatures on Celsius scale, Fahrenheit scale and Kelvin scale, Difference between heat and temperature, Numerical.</p> <p><b>3.2</b> Conduction, Flow of heat along a bar, Steady state of temperature Coefficient of thermal conductivity by Searle's method. (For good conductor), Convection, Radiation, Comparison of conduction, convection and radiation..</p> <p><b>3.3</b> Applications of conduction, convection and radiation, Thermal Expansions (linear, areal, cubical), Numerical.</p> <p><b>3.4</b> Principle, Construction and working of Bimetallic thermometer, Resistance thermometer and Thermocouple thermometer</p> <p><b>3.5</b> Boyle's law, Charle's law and Gay-Lussac's law. General gas equation, Specific heats (<math>C_p</math>, <math>C_v</math>) of gases and their ratio, Numerical.</p>	<p><b>3a.</b> Convert the given temperature in different temperature scales.</p> <p><b>3b.</b> Distinguish the properties of the good and bad conductors of heat.</p> <p><b>3c.</b> Relate the characteristics of the three gas laws.</p> <p><b>3d.</b> Determine the ratio of specific heats for the given gas materials.</p>	<b>9</b>	<b>12</b>
<b>4</b>  <b>Atomic structure &amp;</b>	<p><b>4.1.</b> Filling of electrons in the orbitals-Hund's rule of maximum multiplicity, Pauli exclusion principle, Aufbau's principle</p> <p><b>4.2.</b> Electronic configuration, octet rule &amp; duplet rule .(Electronic configuration upto atomic number 30)</p> <p><b>4.3.</b> Electronic theory of valency Chemical bonds: types and characteristics , electrovalent bond(<math>\text{NaCl}</math>, <math>\text{CaCl}_2</math>), covalent bond(<math>\text{Cl}_2</math>, <math>\text{O}_2</math>, <math>\text{N}_2</math>) co-ordinate bond (<math>\text{SO}_2</math>, <math>\text{SO}_3</math>, Ozone (<math>\text{O}_3</math>), metallic bond(Sodium and Copper metal).</p> <p><b>4.4.</b> Basic Concepts of Volumetric Analysis- Titration, Titrate, Titrant, Normality, Molarity, End Point, Strength, Equivalent weight.</p> <p><b>4.5.</b> Types of Titrations- Acid Base Titration</p>	<p><b>4a.</b> Describe rules for arrangement of electrons</p> <p><b>4b.</b> Write electronic configuration of different elements.</p> <p><b>4c.</b> Distinguish the properties of given material based on the bond formation</p> <p><b>4d.</b> State the concepts included in the volumetric analysis.</p>	<b>9</b>	<b>12</b>

<b>Chemical Bonding</b>	A) Strong acid and strong base B) Weak acid and weak base Redox Titration, Precipitation Titration, Complexometric Titration.			
<b>5</b>  <b>Electro-chemistry and Corrosion, its prevention.</b>	<p><b>5.1.</b>Electrolyte – strong and weak , Non – Electrolyte, Electrolytic cell, Electrochemical cell, cathode ,anode , Electrode potential-oxidation and reduction , construction and working of Daniel cell ,Ionization and Dissociation</p> <p><b>5.2.</b>Faraday’s first and second law and Numerical based on Faraday’s law</p> <p><b>5.3.</b>Electrolysis-Definition, mechanism of electrolysis of <math>\text{CuSO}_4</math> and <math>\text{NaCl}</math> using Platinum electrodes , Electroplating and electro-refining of copper</p> <p><b>5.4.</b>Primary cell and secondary cell- mechanism, examples and application of the types of cells.</p> <p><b>5.5.</b>Corrosion-Types of corrosion- Dry corrosion, Wet corrosion, Oxidation corrosion (Atmospheric corrosion due to oxygen gas ), mechanism, Types of oxide film, Wet corrosion mechanism (Hydrogen evolution in acidic medium) Concentration cell corrosion-Oxygen absorption mechanism in neutral or alkaline medium.</p> <p><b>5.6.</b>Factors affecting the rate of corrosion control- Modification of environment, Use of protective coatings- coating of less active metal like Tin (Tinning), coating of more active metal like Zinc (Galvanizing)Anodic and cathodic protection.</p>	<p><b>5a.</b>Differentiate the salient features of the given electrolytic cell, electrochemical cell.</p> <p><b>5b.</b> Distinguish the given primary and secondary electrolytic cells</p> <p><b>5c.</b>Describe the process of electrolysis for the given electrolyte</p> <p><b>5d.</b> Describe the process of electroplating for the given material</p> <p><b>5e.</b>Describe the phenomenon of the given type of corrosion and its prevention</p> <p><b>5f.</b> Identify the different factors affecting the rate of corrosion for the given type of material. Select the protective measures to prevent the corrosion in the given corrosive medium</p>	<b>12</b>	<b>12</b>

<p style="text-align: center;"><b>6</b></p> <p><b>Polymers, Lubricants and Adhesives</b></p>	<p><b>6.1.</b>Polymer and monomer , Classification on the basis of Molecular structure , on the basis of monomer a)homopolymer -Synthesis ,properties and application of Polyethylene, PVC, Teflon  b)copolymer/heteropolymer-Nylon-6, Nylon 6,6  on the basis of thermal behaviour - Thermoplastics and thermosetting.</p> <p><b>6.2.</b> Types of polymerization reaction , Addition polymerization, Condensation polymerization <b>6.3.</b>Definition of lubricant, function of lubricant and classification <b>6.4.</b>Definition of lubrication, types of lubrication. <b>6.5.</b>Physical properties-viscosity, viscosity index, oiliness, flash and fire point, volatility, cloud and pour point. <b>6.6.</b>Chemical properties-acid value, saponification value, emulsification. <b>6.7.</b>Properties and names of lubricants used for various machines like delicate instruments, heavy load and low speed machine, gears, cutting tools, I.C engine, steam engine <b>6.8.</b>Definition, characteristics of adhesives, classification of adhesives and its uses</p>	<p><b>6a.</b>Differentiate the given type of structural polymers <b>6b.</b> Describ e the polymerization process of the given polymer <b>6c.</b>State the properties and uses of the given polymers <b>6d.</b> Describ e lubricants ,its function and classification <b>6e.</b>State the types of lubrication. <b>6f.</b> Describe the physical and chemical properties of lubricants <b>6g.</b>Explain selection of lubricants for various machines <b>6h.</b> State the properties and uses of adhesives Describe the application of relevant adhesives</p>	<p style="text-align: center;"><b>11</b></p>	<p style="text-align: center;"><b>16</b></p>
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#### SUGGESTED SPECIFICATION TABLE WITH MARKS

UNIT NO	UNIT TITLE	Teaching Hours	DISTRIBUTION OF THEORY MARKS			
			R LEVEL	U LEVEL	A LEVEL	TOTAL
PHYSICS						
I	Units and Measurements	9	3	5	4	12
II	Electricity, Magnetism and Semiconductors	14	5	5	6	16
III	Heat , Temperature and Gas laws	9	3	5	4	12
Total		32	11	15	14	40

## CHEMISTRY

IV	Atomic structure & Chemical Bonding	9	5	4	3	12
V	Electro-chemistry and Corrosion, its prevention.	12	3	4	5	12
VI	Polymers, lubricants and adhesives	11	5	4	7	16
<b>Total</b>		32	13	12	15	40

**Legends:** R-Remembrance (Knowledge), U- Understanding, A- Application and above levels (Revised Bloom's taxonomy)

Note-This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

### SUGGESTED PRACTICALS

*The practical in this section are psychomotor domain PrOs (i.e sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency. **Any 10 practical of Physics & Chemistry should be conducted during the Term.***

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Hrs.
<b>Physics</b>			
1	Measurement of (i) Length, Breadth and Height of a block ,(ii) Internal, External diameter and Height of a hollow cylinder, Using Vernier Callipers of different least counts.	I	4
2	Measurement of (i) Diameter of Sphere and Wire, (ii) Thickness of a plate by using Micrometer Screw Gauge.	I	4
3	Measurement of (i) Radii of concave and convex surfaces, (ii) Thickness of plate by using Spherometer.	I	2
4	Measurement of Specific resistance by voltmeter ammeter method.	II	2
5	Verification of Ohm's law	II	2
6	Measurement of Resistance in series.	II	2
7	Measurement of Resistance in parallel.	II	2
8	Magnetic lines of forces of Bar Magnet.	II	2
9	Study of PN junction diode forward and reverse bias	II	2

10	Study the effect of temperature on the resistance of – thermistor and copper coil.	II	2
11	Determination of co-efficient of thermal conductivity of a good conductor by Searle's method.	II	2
12	Verification of Boyle's law.	III	2
	Practical –assignments-student activities submission.		4
<b>Chemistry</b>			
1	Prepare the solutions of different Concentrations.	I	2
2	Determine the Strength of given acid solution using standard base solution.	I	2
3	Determine the neutralization point of weak acid and weak base using conductivity meter.	I	2
4	Precipitation titration of BaCl <sub>2</sub> with H <sub>2</sub> SO <sub>4</sub> using conductivity meter.	I	2
5	Determine electrochemical equivalent of Cu metal using Faraday's first law.	II	2
6	Determine equivalent weight of metal using Faraday's second law.	II	2
7	Determine the electrode potential of Copper metal.	II	2
8	Determine the voltage generated from chemical reaction using Daniel Cell.	II	2
9	To determine the viscosity of oil lubricant by using Ostwald's Viscometer.	III	2
10	Determine the Acid value of given oil.	III	4
11	Determine the effect of temperature on viscosity for given lubricating oil using Redwood viscometer-1	III	4
12	Determination of saponification value of an oil.	III	2
	Practical –assignments-student activities submission.		4

### SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

- 1) Prepare charts of vernier calliper, micrometer screw gauge, spherometer and travelling microscope.
- 2) Library survey regarding engineering material used in different industries.
- 3) Power point presentation or animation for showing different types of bonds or molecules.
- 4) Seminar on any relevant topic.



## SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- Not only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About 15-20% of the topics/sub-topics which is relatively simpler or descriptive in nature is to be given to the students for self-directed learning and assess the development of the UOs/COs through classroom presentations (see implementation guideline for details).
- Teachers need to ensure to create opportunities and provisions for co-curricular activities.

## SUGGESTED LEARNING RESOURCES

### A) BOOKS

SR. NO.	AUTHOR	TITLE	PUBLISHER
1	J.V.Naralikar,A.W.Joshi	Physics Textbook XI (part1 &2)	National Council of Education Research and Training New Delhi
2	J.V.Naralikar,A.W.Joshi	Physics Textbook XII (part1 &2)	National Council of Education Research and Training New Delhi
3	D.Haliday & R. Resnick	Fundamentals of Physics	Jhon Wiley and Sons , USA
4	R.K.Gaur, S.L.Gupta	Engineering Physics	Dhanpat Rai and Sons Publications.
5	Jain P.C. & Jain Monika	Engineering Chemistry	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
6	S.S.Dara	Engineering Chemistry	S. Chand Publication
7	Bagotsky V S	Fundamental of electrochemistry	Wiley international NJ USA

### B) Web site for references:

[www.physicsclassroom.com](http://www.physicsclassroom.com)  
[www.hyperphysics.com](http://www.hyperphysics.com)  
[www.physicsinfo.com](http://www.physicsinfo.com) <http://nptel.ac.in/course.php?disciplineId=115>  
<http://nptel.ac.in/course.php?disciplineId=104>  
<http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html>  
[www.physicsclassroom.com](http://www.physicsclassroom.com)  
[www.physics.org](http://www.physics.org)  
[www.fearofphysics.com](http://www.fearofphysics.com)  
[www.sciencejoywagon.com/physicszone](http://www.sciencejoywagon.com/physicszone)  
[www.science.howstuffworks.com](http://www.science.howstuffworks.com)  
[www.in.wikipedia.org](http://www.in.wikipedia.org)  
[www.nptel.iitm.ac.in](http://www.nptel.iitm.ac.in)

### C) Video

[www.Youtube.com](http://www.Youtube.com) (elasticity, surface tension, viscosity, sound)

### D) PPT

[www.khanaacademy.com](http://www.khanaacademy.com)  
[www.slidehare.net](http://www.slidehare.net)

## PROGRAMME OUTCOMES

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	2	1	1	1	1	1	-	-
CO2	3	1	1	1	1	1	1	-	-
CO3	3	1	1	1	1	1	1	-	-
CO4	3	1	1	1	1	1	1	-	-
CO5	3	1	1	1	2	1	1	-	-
CO6	3	1	1	1	2	1	1	-	-

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: CIVIL/MECH./ELECT./COMP./E&TC. ENGINEERING**

**COURSE : ENGLISH**

**COURSE CODE: R18SC1707**

**COURSE CATEGORY : FOUNDATION**

**CREDIT : 04**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
2	2	3	80	20	-	-	25	125

**Rationale:**

Competency in English enhances the employability of an engineering professional. In today's competitive world English is important for students in their academics as well as in their prospective career. The students after passing Diploma in Engineering from any discipline, need to use English as a medium of communication in various formal as well as informal situations. They need to be proficient in the four skills of language i.e. listening, speaking, reading and writing. This curriculum is need based and is designed to help the students to communicate in English effectively.

**Course Outcomes:**

1. Formulate grammatically correct sentences.
2. Use relevant words as per context.
3. Comprehend given passages and dialogues.
4. Prepare speeches in given formal situations.
5. Distinguish between various types of communication
6. Communicate effectively by avoiding barriers in various formal and informal situations

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
1	<b>Applied Grammar</b> 1.1. Parts of Speech [Noun, Pronoun, Verb, Adverb, Adjective, Preposition, Conjunction, Interjection] 1.2. Tenses 1.3. Articles 1.4. Punctuation 1.5. Direct-indirect speech 1.6. Active and Passive voice	1a. List the various Parts of Speech 1b. Define different Parts of Speech 1c. Identify the part of speech of the given word 1d. Use appropriate prepositions to construct meaningful sentences. 1e. Use appropriate conjunctions to connect phrases and clauses in the given sentences. 1f. Use correct form of tenses in given situation. 1g. Use relevant articles in constructing sentences. 1h. Punctuate the given sentences by using correct punctuation marks.	08	12

		1i. Change the narration for the given situation. 1j. Change the voice of a given sentence		
<b>2</b>	<b>Vocabulary Building</b> 2.1 Synonyms and Antonyms. 2.2 Spellings 2.3 Words often confused 2.4 One word substitution 2.5 Engineering vocabulary	2a. Use synonyms and antonyms correctly. 2b. Correct the spelling errors in given sentences. 2c. Select appropriate word for the given context. 2d. Substitute given phrase/ sentence by one meaningful word. 2e. Apply the engineering vocabulary in the new /given context	08	16
<b>3</b>	<b>Reading Comprehension</b> 3.1 Comprehension based on dialogues 3.2 Comprehension based on unseen passage	3a. Answer the questions on a given unseen passage/ dialogue. 3b. Answer the questions orally on the given unseen passage with correct pronunciation	04	12
<b>4</b>	<b>Public Speaking</b> 4.1 Importance of public speaking 4.2 Characteristics of a good speech 4.3 Vote of thanks 4.4 Farewell speech 4.5 Introducing a guest	4a. State importance of public speaking 4b. State features of a good formal speech 4c. State characteristics of a good vote of thanks speech 4d. Write a vote of thanks speech for the given situation. 4e. State characteristics of a good farewell speech 4f. Write a farewell speech for the given situation. 4g. State characteristics of a good speech for introducing a guest 4h. Write a speech for introducing a guest in the given situation. 4i. Deliver a speech on a given situation	04	12
<b>5</b>	<b>Basics of Communication</b> 5.1 Definition 5.2 Need and importance of communication 5.3 Communication cycle and elements 5.4 Encoding and decoding 5.5 Types of communication 5.6 Verbal and non-verbal 5.7 Oral and written 5.8 Formal and informal 5.9 Difference between verbal and non-verbal, oral and written, formal and informal	5a. Define communication 5b. State the importance of communication in business 5c. Enlist elements of communication 5d. Explain the various elements of communication. 5e. Identify the different communication elements in a given situation 5f. Draw a neat sketch of communication cycle for a given situation 5g. Explain encoding and decoding 5h. List types of communication	04	12

	communication 5.10 Merits and demerits of oral and written communication	5i. Define verbal, non-verbal, oral, written, formal, informal communication 5j. Identify the type of communication in a given situation 5k. Distinguish between various types of communication 5l. State merits and demerits of oral and written communication 5m. Communicate effectively in a given formal and informal situation.		
<b>6</b>	<b>Effective Communication</b> 6.1 Barriers in communication. <ul style="list-style-type: none"> <li>• Mechanical</li> <li>• Physical</li> <li>• Psychological [Prejudice, status block, negative emotions like fear, ego, low confidence]</li> <li>• Linguistic</li> <li>• Cultural</li> </ul> 6.2 Overcoming barriers 6.3 Principles of communication <ul style="list-style-type: none"> <li>• Clarity</li> <li>• Conciseness</li> <li>• Correctness</li> <li>• Completeness</li> <li>• Feedback</li> <li>• Informality</li> <li>• Media selection</li> <li>• Flexibility</li> </ul>	6a. Define “barrier in communication” 6b. List types of barriers in communication 6c. Explain mechanical, physical, psychological, linguistic, and cultural barriers with suitable examples 6d. Identify the communication barriers in a given situation 6e. Suggest remedies to overcome the given barriers. 6f. List principles of effective communication 6g. Describe the various principles of communication with suitable examples. 6h. Apply the various principles in oral and written communication	04	16

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Applied Grammar	08	03	03	06	12
2	Vocabulary Building	08	04	04	08	16
3	Comprehension	04	02	08	02	12
4	Speech Writing	04	02	02	08	12
5	Basics of Communication	04	04	04	04	12
6	Effective Communication	04	04	04	08	16
	<b>Total</b>	<b>32</b>	<b>19</b>	<b>25</b>	<b>36</b>	<b>80</b>

### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
1	V	Pronounce basic English words correctly.	02
2	V	Meet and greet people formally.	02
3	V	Talk about your family.	02
4	VI	Give directions about places in town.	02
5	VI	Describe your neighbourhood and region.	02
6	III	Answer the questions orally on the given unseen passage with correct pronunciation.	02
7	IV	Deliver any one of the following speeches: Vote of thanks, Farewell speech, Introducing a guest.	02
8	I	Rewrite the given sentences using correct articles.	02
9	I	Change the narration of given sentences from direct to indirect.	02
10	II	Solve the exercise based on vocabulary.	02
<b>Total</b>			<b>20</b>

### SUGGESTED STUDENT ACTIVITIES

5. Group reading: Read one news item from a Standard English newspaper or magazine. Form a group of 4-5 students. Discuss the news from various angles (contents, grammar, and vocabulary) with your group.
6. Conduct quiz on spellings in small groups.

### SPECIAL INSTRUCTIONAL STRATEGIES

1. Show video/animation, film to improve language skills
2. Use flash cards to demonstrate how to use flash cards to improve vocabulary.

### SUGGESTED LEARNING RESOURCES

#### F) Books

Sl. No.	Title of Book	Author	Publication (with year)
1	Applied Grammar and Composition	M.P. Bhatia	M.I. Publications (Eighth Revised Edition), Agra.
2	Advanced English Grammar and Composition	Alok Pandey and Deepak Pandey	Sahni Publication, Delhi-7.
3	Intermediate English Grammar	Raymond Murphy	Cambridge University Press, (Second Edition), New Delhi.
4	Essential English Grammar	Raymond Murphy	Cambridge University Press, New Delhi, ISBN: 9780-0-521-67580-9
5	Effective English with CD	Kumar, E. Suresh; Sreehari, P.; Savithri, J.	Pearson Education, Noida, New Delhi, 2009 ISBN: 978-81-317-3100-0
6	English Grammar at Glance	Gnanamurali, M.	S. Chand and Co. New Delhi, 2011 ISBN:9788121929042

7	Living English Structure	Allen, W.S.	Pearson Education, New Delhi, Fifth edition, 2009, ISBN:108131728498,99
8	English Reading Comprehension	R. Gupta	Ramesh Publishing House, New Delhi
9	The Art of Public Speaking	Dale Carnegie	Ocean Paperbacks
10	Essential Communication Skills	Shalini Aggarwal	Ane Books Pvt Ltd
11	A Course in Communication Skills	Dutt, Rajeevan, Prakash	Foundation Books
12	Word Power Made Easy	Norman Lewis	Pocket Books / Goyal Publishers & Distributors
13	Words Often Confused	Dr. B. R. Kishore	New Light Publishers
14	Perfect Your Spelling Power	Raymond Hill	Maanu Graphics Publishers

#### **G) Major Equipment/ Instrument with Broad Specifications**

Linguaphone language laboratory software

#### **H) Software/Learning Websites**

- a. <https://english.wifistudy.com/>
- b. <https://www.britishcouncil.in/english/learn-online>
- c. <http://learnenglish.britishcouncil.org/en/content>
- d. <http://www.talkenglish.com/>
- e. [www.languageLABsystem.com](http://www.languageLABsystem.com)
- f. [www.wordsworthelt.com](http://www.wordsworthelt.com)
- g. [www.learn4good.com](http://www.learn4good.com)
- h. [www.fluentzy.com](http://www.fluentzy.com)
- i. [www.edufind.com](http://www.edufind.com)
- j. [www.khake.com](http://www.khake.com)
- k. [www.learnenglish.org.uk](http://www.learnenglish.org.uk)
- l. [www.english4engineer.com](http://www.english4engineer.com)
- m. [www.owl.english.purdue.edu](http://www.owl.english.purdue.edu)

### Mapping matrix of PO's and CO's:

Course Name: ENGLISH Course code: R18CE5103	PO 1 Basic and discipline specific knowledg e	PO 2 Proble m Analy sis	PO 3 Design/de velopmen t of solutions	PO 4 Engineerin g Tools, experiment ation and testing	PO 5 The engineering practices for society, sustainability and environment	PO 6 Projec t manag ement	PO 7 Lifelong learning	PSO 1	PSO 2
CO1- Formulate grammatically correct sentences	2	-	-	-	-	2	2	-	-
CO2- Use relevant words as per context	2	-	-	-	-	2	2	-	-
CO3- Comprehend given passages and dialogues	2	-	-	-	-	2	2	-	-
CO4- Prepare speeches in given formal situations.	2	-	-	-	-	2	2	-	-
CO5- Distinguish between various types of communication	2	-	-	-	-	2	2	-	-
CO6- Communicate effectively by avoiding barriers in various formal and informal situations	2	-	-	-	-	2	2	-	-

Rating scale '3' for high, '2' for medium, '1' for low '0' for no correlation



**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: CIVIL/MECH./ELECT./COMP./E&TC. ENGINEERING**

**COURSE : BUSINESS COMMUNICATION**  
**COURSE CATEGORY : FOUNDATION**

**COURSE CODE: R18SC1708**  
**CREDIT : 03**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
1	2	-	-	-	-	@25	25	50

**@ Internal Assessment**

**Rationale:**

Communication is life blood of any business. To be able to communicate effectively is considered one of the foremost employability skills. Fluency and correct pronunciation makes a world of difference in any business situation like meetings, conferences, seminars, presentations etc. Along with that, a business professional has to be proficient in written communication. Hence in this curriculum, speaking and writing skills are emphasized to help the students in interviews, presentations, and other oral as well as written communication situations.

**Course Outcomes:**

1. Give presentation using ICT.
2. Face a mock interview.
3. Write business letters for given formal situations
4. Draft notice, memorandum, and circular in given formal situations.
5. Draft reports on given formal situations.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
1	<b>Presentation Skills</b> 1.1 Need and importance 1.2 Effective presentation – guidelines for effective presentation 1.3 Use of positive Body language for effective presentation 1.4 Guidelines to prepare an effective Power Point Presentation	Use different types of verbal and non-verbal communication during a presentation.	02	--
2	<b>Interview Techniques</b> 2.1 Preparation stage: Preparing for an interview, pre-interview research. 2.2 Factors affecting performance during the	Face a mock interview using appropriate communication skills	02	--

	interview: stress, self-awareness, presence of mind. 2.3 Post-interview follow-up			
3	<b>Business Correspondence-Part-I</b> 3.1 Letter of Enquiry 3.2 Letter of Order 3.3 Letter of Complaint	Draft formal business letters in given situations	04	--
4	<b>Business Correspondence-Part II</b> 4.1 Letter of Job Application 4.2 Letter of Resignation 4.3 Joining letter 4.4 Leave application	Draft formal letters related to employment in given situations.	04	--
5	<b>Office Drafting</b> 5.1 Notice 5.2 Circular 5.3 Memo 5.4 Email writing	Draft notice, memo, circular in given situations	02	--
6	<b>Report Writing</b> 6.1 Visit report 6.2 Accident report 6.3 Progress report	Draft Visit, accident, and progress report in given situations	02	--

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Not applicable

#### SUGGESTED EXERCISES/PRACTICALS

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
1	II	Face a mock Interview	04
2	I	Talk about different jobs and types of work	02
3	I	Talk about your hobbies and enquire about those of other people	02
4	I	Enquire about people's programmes, plans and booking facilities	02
5	IV	Draft a letter of Job Application with resume	02
6	III	Draft a request letter for everyday institute activities	02
7	V	Draft a Circular/ Notice on a given situation	02
8	VI	Email a Visit Report/ Accident Report to given email addresses.	02
9	I	Preparation of PPT /report on micro-project	04
10	I	Presentations on micro-project using ICT	06
<b>Total</b>			<b>28</b>

#### SUGGESTED STUDENT ACTIVITIES

1. Summarize the contents of a famous book/books.[fiction/nonfiction]
2. Write a report on various formal events in your college.
3. Identify a good business leader, study his presentations and prepare a report on it..

## SPECIAL INSTRUCTIONAL STRATEGIES

1. Show video/animation, film to improve business communication

## SUGGESTED LEARNING RESOURCES

### I) Books

Sr. No.	Title of Book	Author	Publication
1	Communication Skills	MSBTE	MSBTE, Mumbai
2	Effective Communication Skills	M Ashraf Rizvi	Tata McGraw-Hill
3	Communication Skills	Sanjay Kumar and Pushp Lata	Oxford University Press
4	Personality Development and Soft Skills	Barun K. Mitra	Oxford University Press
5	Kumar's Group Discussions and Interviews	Dr. B. R. Kishore , D. S. Paul	Vee Kumar Publications Private Limited, New Delhi-110008.
6	PowerPoint Presentations that Sell	Adam B. Cooper	McGraw Hill Professionals.
7	Business Communication	R. C. Bhatia	Ane Books India, New Delhi.
8	Developing Communication Skills	Krishna Mohan, Meera Banerji	Macmillan India Ltd., New Delhi.
9	300+ Successful Business Letters For Associates	Alan Bond and Nancy Schuman	BARON'S
10	The McGraw Hill Handbook of More Business Letters		McGraw Hill

### J) Major Equipment/ Instrument with Broad Specifications

Linguaphone language laboratory software

### K) Software/Learning Websites

- a) British council – [LearnEnglish website](http://learnenglish.britishcouncil.org/en/) – <http://learnenglish.britishcouncil.org/en/>
- b) British council – [LearnEnglish website](http://learnenglish.britishcouncil.org/en/) – fun and games –
- c) <http://learnenglish.britishcouncil.org/en/study-break>
- d) British council – [LearnEnglish website](http://learnenglish.britishcouncil.org/en/business-and-work) – business and work –
- e) <http://learnenglish.britishcouncil.org/en/business-and-work>
- f) <http://www.talkenglish.com>
- g) [www.wordsworthelt.com](http://www.wordsworthelt.com)
- h) [www.notesdesk.com](http://www.notesdesk.com)
- i) <http://totalcommunicator.com/>
- j) [www.speaking-tips.com](http://www.speaking-tips.com)
- k) [www.skillstudio.co.uk](http://www.skillstudio.co.uk)
- l) [www.mindtools.com](http://www.mindtools.com)
- m) [www.storynory.com](http://www.storynory.com)

**Mapping matrix of PO's and CO's:**

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
CO1	-	-	-	-	-	2	2	-	-
CO2	-	-	-	-	-	2	2	-	-
CO3	-	-	-	-	-	2	2	-	-
CO4	-	-	-	-	-	2	2	-	-
CO5	-	-	-	-	-	2	2	-	-

Rating scale '3' for high, '2' for medium, '1' for low

**DIPLOMA PROGRAMME IN: ELECTRICAL / E&TC ENGINEERING**

**COURSE : APPLIED SCIENCE**  
**COURSE CATEGORY : FOUNDATION**

**COURSE CODE: R18SC1709**  
**CREDITS : 8**

**TEACHING AND EXAMINATION SCHEME:**

Teaching Scheme			EXAMINATION SCHEME						
	TH	PR	ONLINE EXAM HRS	TH	TEST	PR	OR	*TW	TOTAL
Physics	2	2	1	40	10	-	-	25	75
Chemistry	2	2	1	40	10	-	-	25	75

**\*TW includes 10 marks for Science Micro Project.**

**RATIONALE**

Diploma engineers have to deal with various materials, methods and machines. Adequate knowledge of basic principle of Physics and Chemistry will help the students to understand the concepts better in any field of engineering. The course will develop analytical capabilities of students so that they can characterize transform and use material in engineering and apply knowledge gained in solving related engineering problems. It will develop the habit of scientific reasoning in students so that they can work with open and enquiring mind. They must learn and apply the concepts and principles of science like Metals, Alloys, Insulators, Cells, Batteries, Water, Electricity, Magnetism and LASERS. .

**COURSE OUTCOMES (COs)**

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

1. Select appropriate Capacitors and Resistance in circuits.
2. Apply the principle of Electricity and magnetism for use of various measuring instruments.
3. Use equipments based on principle of LASER and Optical fibre in industrial application .
4. Use appropriate Water Treatment process to solve water related problems.
5. Select appropriate Batteries for different applications.
6. Select and use appropriate Metals, Alloys and Insulating materials in various applications.

**COURSE DETAILS:**

The following topics should be taught and assessed in order to develop UO's in cognitive domain for achieving the CO's

UNIT	NAME OF THE TOPICS AND SUBTOPICS	LEARNING OUTCOMES	HOURS	MARKS
<b>1</b> <b>Current Electricity,</b>	1.1 Concept of EMF of cell, internal resistance of cell, difference between EMF and potential difference, Kirchhoff's laws. 1.2 Wheatstone's bridge, balancing condition	<b>1a.</b> Calculate the EMF of the given cell using potentiometer. <b>1b.</b> Calculate the voltage across various components	9	12

<b>Capacitors and Capacitance</b>	<p>of Wheatstone's bridge, Meter bridge,</p> <p>1.3 Potentiometer, principle of potentiometer, potential gradient, balancing condition of potentiometer, measurement of EMF by potentiometer, Numerical.</p> <p>1.4 Capacitance and capacitor, unit of capacitance, parallel plate capacitor, effect of dielectric on capacitance, combination of capacitors in series and parallel and energy stored in a capacitor, Numerical.</p>	<p>of electric circuit.</p> <p><b>1c.</b> Calculate the value of the given resistance by Meter Bridge using the principle of Wheatstone's bridge.</p> <p><b>1d.</b> Explain working of a capacitor. Calculate the equivalent capacity and energy stored in the combination of capacitors</p>		
<b>2</b> <b>Magnetic effect of electric current</b>	<p>2.1 Magnetic effect of electric current, lines of induction due to a straight conductor, right-hand thumb rule, magnetic induction (direction and magnitude), concept of uniform magnetic field.</p> <p>2.2 Force of a magnetic field on current carrying conductor, Fleming's left-hand rule, couple acting on a rectangular coil placed in the uniform magnetic field, Numerical.</p> <p>2.3 Principle, construction and working of moving coil galvanometer.</p> <p>2.4 Conversion of galvanometer into ammeter and expression for shunt resistance. Conversion of galvanometer into voltmeter and expression for series resistance, Numerical.</p>	<p><b>2a.</b> Describe the concept of magnetic intensity and flux with relevant units.</p> <p><b>2b.</b> Explain magnetic effect of current carrying conductor.</p> <p><b>2c.</b> Describe the conversion of Galvanometer into Ammeter.</p> <p><b>2d.</b> Describe the conversion of Galvanometer into Voltmeter.</p>	14	16
<b>3</b> <b>Lasers and Fiber Optics</b>	<p>3.1 Excitation of particle, optical pumping, types of transitions – non radiative and radiative.</p> <p>3.2 Spontaneous and stimulated emission, population inversion, resonance cavity, active system,</p> <p>3.3 Types of lasers, Ruby laser, Helium-Neon laser, and comparison between ruby and He-Ne lasers, Uses of lasers.</p> <p>3.2 Reflection, refraction, laws of refraction, Total Internal Reflection (TIR). Principle, types, properties and applications of optical fibers.</p>	<p><b>3a.</b> Describe the construction and working of three energy level laser system.</p> <p><b>3b.</b> Describe the phenomena of total internal reflection for the given mediums.</p> <p><b>3c.</b> Describe light propagation in the given type of optical fiber.</p>	9	12

<p><b>4</b></p> <p><b>Water Treatment and Analysis</b></p>	<p>4.1. Hardness-types, EDTA method, degree of hardness of the water in terms of equivalent amount of <math>\text{CaCO}_3</math>, Numericals based on degree of hardness .</p> <p>4.2. Effect of hard water in boilers and prevention: Boiler corrosion , Caustic embrittlement ,priming and foaming , scales and sludges.</p> <p>4.3. Water softening : zeolite process, ion exchange process (cation exchange and anion exchange )</p> <p>4.4. Municipal water treatment - Sedimentation , Coagulation , Filtration and Sterilization</p> <p>4.5. Waste water- Characteristics, Dissolved oxygen ,BOD and COD, Sewage treatment , recycling of waste water</p> <p>4.6. De-salination of brackish water process by a) reverse osmosis b) Electro dialysis</p> <p>4.7. Definition of pH and pOH , pH scale, Numerical problem on pH and pOH and Industrial applications</p>	<p><b>4a.</b> Define hardness of Water</p> <p><b>4b.</b> Calculate the hardness of water for the given data</p> <p><b>4c.</b> Describe the effects of hard water in boilers</p> <p><b>4d.</b> Explain the given type of water softening process</p> <p><b>4e.</b> Describe the purification of municipal water for the given process</p> <p><b>4f.</b> Describe the reverse osmosis for the given type of water</p> <p><b>4g.</b> Describe the process of desalination of water</p> <p><b>4h.</b> State the concept of pH and pOH numerical related with it. Applications of pH in engineering</p>	<p>12</p>	<p>16</p>
<p><b>5</b></p> <p><b>Electro-chemistry and batteries</b></p>	<p>5.1. Electrical conductance in metals and electrolytes, specific conductance, equivalent conductance, cell constant</p> <p>5.2. Electrodes-Hydrogen electrode, Calomel electrodes and glass electrodes</p> <p>5.3. Batteries – Dry cell, alkaline battery, Lead acid storage cell and Ni-Cd battery, <math>\text{H}_2</math>-<math>\text{O}_2</math> fuel cell, Lithium ion battery and Invertors.</p> <p>5.4. Electrochemical sensors-definition ,working, principle , advantages and applications</p> <p>5.5. Conducting polymers –Definition and categories or classification</p>	<p><b>5a.</b> Differentiate the electrical conductance in metals and electrolytes</p> <p><b>5b.</b> Identify factors affecting conductivity of the given solution</p> <p><b>5c.</b> Describe construction of given electrodes</p> <p><b>5d.</b> Describe the process of calculation of the strength of acid and base</p> <p><b>5e.</b> Calculate specific and equivalent conductance of given electrolyte</p> <p><b>5f.</b> Describe construction and working of given type of battery.</p> <p><b>5g.</b> Describe the construction, working of electrochemical sensors Describe the classification of conducting polymers.</p>	<p>10</p>	<p>12</p>
<p><b>6</b></p> <p><b>Metals, alloys</b></p>	<p>6.1. Properties of metals like Copper, Aluminium , Tungsten, Platinum and Nickel</p> <p>6.2. Thermocouple alloy- Composition and characteristics of nickel alloy, Platinum</p>	<p><b>6a.</b> Describe the properties of the given metal.</p> <p><b>6b.</b> Select relevant thermocouple alloy for</p>	<p>10</p>	<p>12</p>

<b>and insulators</b>	/Rhodium , Tungsten/Rhenium, Chromel – gold/Iron a. Electrical insulators – Classification- a) Solid ceramics porcelain ,Mica, asbestors , Urea –Formaldehyde resin, Bakelite and glass 6.3. Liquid -silicon fluid ,Gaseous- inert Gases , Hydrogen and nitrogen gas 6.4. Types of rubber- natural and synthetic, Processing of natural rubber. a. Synthetic Rubber- Properties and application of Buna-N, Thiokol, Neoprene.	given application <b>6c.</b> Describe the properties and uses of the given insulator. <b>6d.</b> Select relevant insulator for given system. Describe the techniques of unit operations.		
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### SUGGESTED PRACTICALS

*The practicals in this section are psychomotor domain PrOs (i.e sub-components of the COs), to be developed and assessed in the student to lead to the attainment of the competency Any 10 practical of Physics and Chemistry should be conducted during the Term.*

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Hours.
<b>PHYSICS</b>			
1	Verification of law of condensers in series.	I	2
2	Verification of law of condensers in parallel.	I	2
3	Measurement of EMF of cell by potentiometer.	I	2
4	Comparison of EMF of two cells by single cell method using potentiometer	I	2
5	Comparison of EMF of two cells by sum and difference method using potentiometer.	I	2
6	Measurement of internal resistance of a cell using potentiometer.	I	2
7	Measurement of unknown resistance using meter bridge.	I	2
8	Conversion of Galvanometer to Ammeter.	II	2
9	Conversion of Galvanometer to Voltmeter.	II	2
10	Use of magnetic compass to determine neutral point.	II	2
11	Measurement of divergence of light beam by laser.	III	2
12	Study the phenomenon of Total Internal Reflection and determine critical angle of incidence.	III	2
	Practical –assignments, student activities submission (Micro-project).		8



## CHEMISTRY

1	Determine the Alkalinity of water sample.	I	2
2	Determine Chloride content in the given water sample by Mohr's method.	I	2
3	Determine the Total Hardness (Temporary Hardness and Permanent Hardness) of water sample by EDTA method.	I	2
4	Determine the Dissolved Oxygen present in the water sample by using Winkler's method.	I	2
5	Determine the pH value of given solution using pH meter.	II	2
6	Find the Cell constant of the conductivity cell.	II	2
7	Determine Specific Conductance and Equivalence Conductance of given salt sample solution.	II	2
8	a )Prepare buffers and standardization of pH meter (pH 4 to 9 ) b)Determine the molarity of HCl pH-metrically ,provided M/10 NaOH	II	2
9	Prepare Urea Formaldehyde resin.	III	2
10	Determine percentage of Copper from the brass.	III	2
11	Determine Phosphate in a given water sample by using Spectrophotometer.	I	2
12	Estimation of Calcium in Cement sample.	I	2
	Practical –assignments, student activities submission (Micro-project).		8

## SUGGESTED SPECIFICATION TABLE WITH MARKS

Unit No.	Unit title	Teaching Hours	Distribution of theory marks			
			R Level	U Level	A Level	Total Marks
PHYSICS						
I	Current Electricity, Capacitors and Capacitance	9	3	5	4	12
II	Magnetic effect of electric current	14	5	5	6	16
III	Lasers and Fiber Optics	9	3	5	4	12
Total		32	11	15	14	40

## CHEMISTRY

1	Water Treatment and analysis	12	4	6	6	16
2	Electrochemistry and batteries	10	3	4	5	12
3	Metals, alloys and Insulators	10	3	4	5	12
Total		32	10	14	16	40

**Legends:** R-Remembrance (Knowledge), U- Understanding, A- Application and above levels (Revised Bloom's taxonomy)

Note-This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

### SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course:

1. Market survey of different resins and compare the following points.
  - i. Structure
  - ii. Properties
  - iii. Applications.
2. Library survey regarding engineering material used in different industries.
3. Seminar on any relevant topic.

### SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course:

- i. Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- ii. Not only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- iii. About 15-20% of the topics/sub-topics which is relatively simpler or descriptive in nature is to be given to the students for self-directed learning and assess the development of the LOs/COs through classroom presentations (see implementation guideline for details).
- iv. Teachers need to ensure to create opportunities and provisions for co-curricular activities.
- v. Guide student(s) in undertaking micro-projects.

### SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. She/he ought to submit it by the end of the semester to develop the industry oriented COs.

Each micro-project should encompass two or more COs which are in fact, an integration of practicals, cognitive domain and affective domain LOs. The micro-project could be industry application based, internet-based, workshop-based, laboratory based or field-based

- i) **Optical Fiber and TIR:** Prepare models by using water and diode laser to demonstrate total internal reflection and the working of optical fiber.
- ii) **Battery and Cell:** Collect wastage material from lab and household and prepare working model of cell.

- iii) **Adhesives:** Prepare model to demonstrate the applications of various adhesives.
- iv) **Polymer:** Collect the samples of different polymers and list their uses.
- v) **Series and parallel resistances:** Prepare models for combination of series and parallel resistances using bulbs/ LED.
- vi) **Systems and units:** Prepare chart on comparison of systems of units for different physical quantities.
- vii) **Magnetic flux:** Prepare models to demonstrate magnetic lines of lines of forces of different types of magnets.
- viii) **Types of bonds:** Prepare chart and models displaying different types of bonds with examples.
- ix) **Ionization:** Prepare chart displaying ionization phenomenon.
- x) **Properties of Laser:** Use Key chain laser to differentiate laser with ordinary light.
- xi) **Water analysis:** Collect water samples from different water sources and find the characteristics like acidity, conductivity, dissolved solids, suspended particles.
- xii) **Water treatment:** Collect 3 to 5 water samples to find the dosage of bleaching powder required for its sterilization.
- xiii) **Water analysis:** Prepare model to find the soap foaming capacity of bore water on addition of soda ash.
- xiv) **Fuels:** Prepare chart showing different types of liquid fuels showing their calorific values and uses.
- xv) **Cement:** Collect different samples of cement and find their initial and final setting time.
- xvi) **Refractory materials:** Prepare chart showing properties of refractory materials.
- xvii) **Metal properties:** Prepare chart showing different industrial application of metal and relate it with required property or properties using internet.
- xviii) **Alloy steel:** Find the effect of alloying elements like Mn, Cr, Ni, W, V, Co on properties of steel. Prepare chart of showing percentage composition, properties and industrial applications of different types of steel based on above alloying elements using internet.
- xix) **Capacitors:** Prepare the models of various types of capacitors.
- xx) **Current electricity:** Make one circuit with bulbs/ LED/ connected in parallel or series.
- xxi) **LASER:** Prepare the presentation on the industrial application of LASER.
- xxii) **Water analysis:** Collect water samples from different water sources and determined the acidity, conductivity, dissolved solids, suspended particles in the sample.
- xxiii) **Water treatment:** Collect 3 to 5 water samples from borewell and determined the dosage of bleaching powder required for its sterilization.
- xxiv) **Water analysis:** Determine the soap foaming capacity of bore water on addition of soda ash.
- xxv) **Energy sources:** Prepare chart showing different types of energy sources with their advantages.
- xxvi) **Electrolytic Cells:** Collect fruit and vegetable and prepare working model of cell.
- xxvii) **Electric Insulators:** Collect the samples of different insulators and list their industrial applications.
- xxviii) **Thermocouple:** Prepare chart showing different types of thermocouples with their characteristics used in electronic and electrical industry.

## SUGGESTED LEARNING RESOURCES

### A. BOOKS

SR. NO.	AUTHOR	TITLE	PUBLISHER
1	J.V.Naralikar,A.W.Joshi	Physics Textbook XI (part1 &2)	National Council of Education Research and Training New Delhi
2	J.V.Naralikar,A.W.Joshi	Physics Textbook XII (part1 &2)	National Council of Education Research and Training New Delhi
3	D.Haliday & R. Resnick	Fundamentals of Physics	Jhon Wiley and Sons , USA
4	R.K.Gaur, S.L.Gupta	Engineering Physics	Dhanpat Rai and Sons Publications.
5	Jain P.C. & Jain Monika	Engineering Chemistry	Dhanpat Rai Publishing Company (P) Ltd., New Delhi.

6	S.S.Dara	Engineering Chemistry	S. ChandPublication
7	Bagotsky V S	Fundamental of electrochemistry	Wiley international NJ USA

**B. Web site for references:**

[www.physicsclassroom.com](http://www.physicsclassroom.com)

[www.hyperphysics.com](http://www.hyperphysics.com)

[www.physicsinfo.com](http://www.physicsinfo.com) <http://nptel.ac.in/course.php?disciplineId=115>

<http://nptel.ac.in/course.php?disciplineId=104>

<http://hyperphysics.phy-astr.gsu.edu/hbase/hph.html>

[www.physicsclassroom.com](http://www.physicsclassroom.com)

[www.physics.org](http://www.physics.org)

[www.fearofphysics.com](http://www.fearofphysics.com)

[www.sciencejoywagon.com/physicszone](http://www.sciencejoywagon.com/physicszone)

[www.science.howstuffworks.com](http://www.science.howstuffworks.com)

**C. Video**

[www.Youtube.com](http://www.Youtube.com) (surface tension, viscosity, sound)

**D. PPT**

[www.khanaacademy.com](http://www.khanaacademy.com)

[www.slidehare.net](http://www.slidehare.net)

**CO-PO MAPPING**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	1	1	1	1	2	1		
CO2	3	1	1	1	1	2	1		
CO3	3	1	1	1	1	2	1		
CO4	3	1	1	1	2	2	1	-	-
CO5	3	1	1	1	1	2	1		
CO6	3	1	1	1	1	2	1		

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : ELECTRONICS LAB PRACTICE I**                      **COURSE CODE: R18 EX1501**  
**COURSE CATEGORY : FOUNDATION**                      **CREDIT : 06**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
02	02	-	-	-	-	@50	50	100

**@ Internal exam**

**Rationale:**

Electronics Lab Practice is the introduction to the world of electronics. The subject includes the study of basic components, its various types and applications. It gives practical knowledge regarding various instruments while handling and develops various skills.

**Course Outcomes:**

CO-1 To identify passive components used in electronic circuits.

CO-2 To determine the values of passive components from the marking representation on them.

CO-3 To select passive component for intended applications.

CO-4 To categorize switches and displays.

CO-5 To measure the signal parameters using measuring instruments.

CO-6 To construct simple circuits using Laboratory tools ensuring safety precautions.

**Course Details:**

NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
<b>Unit1 Resistors:</b> 1.1 Classification of components active and passive. 1.2 Types of resistors , materials used 1.3 General specification of resistors, power rating, Ohms Law 1.4 Colour coding for three, four, five bands(simple numerical ) 1.5 Classification of Resistors -Fixed ,variable ,its types and applications 1.6 LDR-construction and principle with applications	1a. Classify electronic components 1b. Identify the type of resistor 1c. List the specifications of resistors 1d. Draw the symbols of various types of resistors 1e. Determine the value of resistance from colour bands	06	-

<b>Unit2 Capacitors</b> 2.1 Classification of capacitors, Dielectric materials used 2.2 Specifications-working voltage, capacitance, equations of capacitance 2.3 Coding of capacitors using numbers, colour code 2.4 Capacitance -classification fixed ,variable, electrolytic, non-electrolytic 2.5 Units of capacitance 2.6 Applications of capacitors	2a. Classify types of capacitors 2b. Write the specifications of capacitors. 2c. Determine the value of capacitor from the codes 2d. Draw symbol of capacitor and its types	05	-
<b>Unit3 Inductors</b> 3.1 Concept of permeability, Faradays Law of electromagnetic induction 3.2 Classify inductors-air core, ferrite core, iron core 3.3 Applications of inductors in Transformers 3.4 Identification of inductance from Colour codes 3.5 Unit of inductance	3a. Classify inductors 3b. Explain the applications of inductors 3c. To determine the value of inductance from colour code	05	-
<b>Unit4 Displays and Switches:</b> 4.1 Structure of(LED),types 4.2 Seven, Fourteen, Sixteen segment display, CRT, LCD 4.3 Switches -Specifications: voltage rating, contact current rating, contact resistance and life. 4.4 Characteristics of switch and relay: operating time, release time, bounce time, electrical and mechanical life 4.5 Applications of Toggle, Rotary, Rocker, Slide type switches	4a. Draw the symbol of LED 4b. Write the applications of displays 4c. Draw the symbols of switches 4d. Select switch as per application	05	-
<b>Unit5 Common Measuring Instruments Cables and Connectors</b> 5.1 Multimeter: -Analog and digital -Measurement of Resistance, voltage, continuity testing 5.2 Regulated Power Supply: Front panel controls and their details 5.3 Function Generator and CRO Front panel controls and their details Observation of waveform on CRO 5.4 Types of cables- construction and applications of coaxial, Twin core, optical fibre and FRC 5.5 Types of connectors -BNC, D-type, audio, video, printer, FRC and RJ-45 connectors	5a. Draw the front panel of multimeter 5b. List the applications of CRO, Function generator and power supply 5c. Sketch various types of cables and label it. 5d. State the use of cables and connectors	06	-
<b>Unit6</b> <b>Ac signal and Printed circuit Boards Tools</b>	6a. Draw the AC signal and label its	05	-

6.1 AC fundamentals. 6.2 Voltage & current relationship for pure resistive, inductive & capacitive circuits [No derivation] 6.3 Time constant concept with equations and waveforms. 6.4 PCB -types Bread board, strip board 6.5 Types of tools-soldering iron, crimping Tool, pliers	parameters 6b. Sketch the V, I diagram for R, L and C circuits 6c. Differentiate various types of PCB 6d. List various tools used in Electronics Lab		
		32	-

### **SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)**

**Not applicable**

### **SUGGESTED EXERCISES/PRACTICALS**

<b>S. No.</b>	<b>Unit No.</b>	<b>Practical Exercises (Outcomes' in Psychomotor Domain)</b>	<b>Appro. Hrs. Required</b>
1	I	To calculate and measure values of various types of resistors from Colour Coding and by Multimeter	02
2	I	Identification of active devices	02
3	II	To determine values of Capacitance using Colour code and from written values on them.	02
4	III	To identify inductors and to determine the value using colour code	02
5	IV	To identify different type of Displays.	02
6	IV	To identify different switches and relays.	02
7	V	Study of measuring instruments in lab. Observation and measurement of a signal from function generator on CRO.	02
8	V	To identify different types of Cables and Connectors	02
9	VI	To observe different types of PCB and understand the manufacturing process.	02
10	VI	To handle and understand different Tools in the Lab with safety precautions	02
<b>Total</b>			<b>20</b>

### **SUGGESTED STUDENT ACTIVITIES**

Draw the representation (symbols) of various components in the electronic lab

Prepare a list of safety measures to be taken in the lab

### **SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic instruments.

Arrange a visit to nearby small scale manufacturing unit(PCB) and make a report of tools and equipments used..

### **SUGGESTED LEARNING RESOURCES**

**A Books**

Sl. No.	Title of Book	Author	Publication (with year)
1	A Text Book of Electrical technology	B.L.Theraja	S.chand publication
2	Basic electronics and linear circuits	N.N.Bhargava S.C.Gupta	Tata Mc Graw Hill
3	Printed Circuit Board,Design &Technology	Walter Bosshart	Tata Mc Graw Hill

**B Major Equipment/ Instrument with Broad Specifications**

Serial no	Equipment/ Instrument with Broad Specifications
1	Variable DC power supply 0-30V,2A
2	Cathode Ray Oscilloscope Dual Trace 20MHz
3	Function Generator 0-1MHz with sine, Square, triangular output with variable amplitude and frequency
4	Digital Multimeter 3 1/2 digit display,9999 counts
5	Bread board 840-1000 contact points
6	Display Trainer boards and kits for experiments
7	LCR Q meter

**C Software/Learning/ [Simulations](http://www.electronic-lab.com) Websites**  
[www.electronic-lab.com](http://www.electronic-lab.com)
**CO-PO-PSO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2	2	-	1	-	1	1	1	1
CO2	3	2	-	2	1	1	2	2	2
CO3	2	2	-	1	2	2	2	2	2
CO4	2	1	1	2	2	1	2	2	2
CO5	2	2	1	3	2	-	2	2	2
CO6	2	1	2	3	2	1	2	2	2

**3: High 2: Moderate and 1:Low Relationship**



**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : FUNDAMENTAL'S OF PROGRAMMING COURSE CODE: R18EX1502**  
**COURSE CATEGORY: Foundation CREDIT : 6**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	2	3	80	20	-	-	25	125

**Rationale:**

This course covers the fundamentals of 'C' Programming. Basics of the logic development and programming along with debugging tools are introduced. Basic structure of 'C' programming is fully introduced. This course helps to develop logic and to code any primary level application.

**Course Outcomes:**

CO1: Develop logic through algorithm and flowchart for given application

CO2: Use of various keywords and operators according to the application

CO3: Select various techniques such as loops, decision statement according to the application

CO4: Select various data types such as array, structure according to the application

CO5: Develop the function for given application

CO6: Select effective re-allocation technique of pointers

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
1.	<b>Program Planning Concepts</b>  1.1 To develop logic by designing an Algorithm  1.2 Representation of an Algorithm as a Flowchart  <b>Programming Languages</b>  1.3 What is a Programming Language?  1.4 Types of Programming	1a. Introduction to steps to develop logic  1b. Introduction to types of programming languages  1c. Introduction to testing and debugging tools	10	12

	<p>Languages – Machine-level, Assembly-level and High-level Languages.</p> <p>1.5 High-level Programming Language Tools – Compiler, Linker, Interpreter,</p> <p>1.6 Intermediate Language Compiler and Interpreter, Editor, GUI</p> <p><b>Program Testing and Debugging</b></p> <p>1.7 Definition of Debugging, editing</p> <p>1.8 Types of Program Errors</p> <p>1.9 Debugging a Program for Syntax Errors</p> <p>1.10 Debugging a Program for Logical Errors</p>			
2.	<p><b>Introduction to ‘C’</b></p> <p>2.1 History of C, Features of ‘C’, advantages of ‘C’, structure of ‘C’</p> <p>Program</p> <p>2.2 Character set, keywords, constants, variables, rules of variables,</p> <p><b>Data type:</b></p> <p>2.3 Declarations, initializations, assignments, memory sizes, formatting characters and minimum / maximum values for each data types</p> <p>2.4 Type modifiers, type conversion</p>	<p>2a. Introduction and history of C</p> <p>2b. Basic structure of “C”</p> <p>2c. Data types of ‘C’</p> <p>2d. Type modifiers</p> <p>2e. Types of operators</p> <p>2f. Precedence of operators</p> <p>2g. I/O statements</p>	10	12

	<b>Operators:</b>  2.5 Arithmetic, Logical, assignment, relational, increment and decrement  2.6 Conditional, bit wise, special operators  2.7 Precedence, expressions,  2.8 Formatted input and output statements.			
3.	<b>Decision and Loop Control</b>  3.1 Decision making and branching: if statement (if, if-else, if-else-if, ladder, nested if- else)  3.2 Switch statement.  <b>Loop Control:</b>  3.3 What is loop, why to use loops, pre test and post test loops  3.4 while, do-while  3.5 for loops  3.6 Nested loops  3.7 break and continue statement	3a. Decision making and branching statements.  3b. Decision making and loop statements.  3c. Break and continue statements	12	16
4.	<b>Arrays and Strings</b>  <b>Arrays:</b>  4.1 Declaration, initialization of one dimensional, two dimensional arrays  4.2 size of array, memory allocation of array  4.3 Accessing array elements using index  4.4 Operations such as searching	4a. Introduction of array  4b. Accessing array elements  4c. Operations on an array  4d. Introduction of string  4e. Use of string library functions	12	16

	<p>and sorting of array</p> <p><b>Strings:</b></p> <p>4.5 Declaration and initialization of string variables</p> <p>4.6 String handling functions from standard library (strlen (), strcpy (), strcat (), strcmp()).</p>			
5.	<p><b>Functions</b></p> <p>5.1 Basics of a function, Need of functions</p> <p>5.2 How function works, Function definition, internal and external variables, scope and lifetime of variables</p> <p>5.3 Function call, passing arguments to functions (call by value, call by reference),</p> <p>5.4 return values, storage classes</p> <p>5.5 Library functions: Definition and review</p> <p><b>Structures</b></p> <p>5.6 Defining structure</p> <p>5.7 Declaring and accessing structure members</p> <p>5.8 Initialization of structure</p> <p>5.9 Arrays of structure.</p>	<p>5a. Basics of functions</p> <p>5b. Need and working of functions</p> <p>5c. Function call methods</p> <p>5d. Return from function</p> <p>5e. Storage classes</p> <p>5f. Introduction to structure.</p> <p>5g. Accessing structure elements</p> <p>5h. Arrays of structures</p>	10	12
6.	<p><b>Pointers</b></p> <p>6.1 Concept of pointer</p> <p>6.2 Declaration and initialization of pointer variable</p> <p>6.3 Pointer to array</p> <p>6.4 Pointer to string</p>	<p>6a. Explain Basic Concepts of Pointers.</p> <p>6b. Advantage of using pointers</p> <p>6c. Implementation of pointers to array</p> <p>6d. Implementation of pointer</p>	10	12

		to string		
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### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Program Planning Concepts	10	6	6	-	12
2.	Introduction to 'C' Data Types Operators	10	6	6	-	12
3.	Decision and Loop Control	12	2	4	10	16
4.	Arrays and Strings	12	2	6	8	16
5.	Functions Structures	10	-	4	8	12
6.	Pointers	10	2	6	4	12
	<b>Total</b>	<b>64</b>				<b>80</b>

### SUGGESTED EXERCISES/PRACTICALS (Any 10)

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx. Hrs. Required
1.	2	Simple programs involving arithmetic and logical expressions.	4
2.	3	Program using if-else control statement	6
3.	3	Program using Switch case.	4
4.	3	Program using for loop.	6
5.	3	Program using do- while loop	4

6.	4	Program on manipulation of single dimensional array.	6
7.	4	Program using 2-dimensional array.	6
8.	4	Program involving manipulation of string	6
9.	4	Program using user defined function.	4
10.	5	Program using pointer to structure	6
11.	6	Program using pointer to array.	6
12.	5	Program using call by reference	6
<b>Total Hours</b>			<b>64</b>

### SUGGESTED STUDENT ACTIVITIES

7. Group discussions to develop logic
8. Assignments for program practice

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Give Mini projects to students.

### SUGGESTED LEARNING RESOURCES

#### L) Books

Sl. No.	Title of Book	Author	Publication (with year)
1.	The C Programming Language	Kernighan, Ritchie	Prentice Hall of India
2.	Programming Language Concepts	Carlo Ghezzi, Mehdi Jazayeri	John Wiley and Sons
3.	Programming in ANSI C	E. Balagurusamy	Tata McGraw Hill
4.	Let Us C	Yashavant Kanetkar	BPB Publications
5.	Computer Fundamentals	Pradeep K. Sinha and Priti Sinha	BPB Publications

#### M) Major Equipment/ Instrument with Broad Specifications

#### N) Software/Learning/ [Simulations](#) Websites

##### Software:

- Turbo C
- Borland C

<http://cplus.about.com/od/beginnerctutorial/a/blctut.htm>

<http://computer.howstuffworks.com/c.htm>

**Mapping matrix of PO's and CO's:**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2	2	1	1	-	1	2	-	1
CO2	2	1	2	-	-	1	2	2	2
CO3	-	2	2	-	2	2	2	2	2
CO4	-	2	2	2	2	2	2	2	2
CO5	-	2	3	2	2	2	1	2	3
CO6	-	3	3	2	2	3	1	2	3

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**

**COURSE: ENGINEERING GRAPHICS SKILLS**

**COURSE CODE: R18ME1204**

**COURSE CATEGORY: FOUNDATION**

**CREDIT: 04**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
2	2	-	-	-	-	-	50	50

**Rationale:**

Drawing which is known as the language of engineers is widely used means of communication among the designers, engineers, technicians & craftsmen in an industry. The translation of ideas into practice without the use of this graphic language is really beyond imagination. Thus for the effective & efficient communication among all those involved in an industrial system, it becomes necessary for a diploma engineer to acquire the appropriate skills in the use of graphic language. This preliminary course aims at building a foundation for the further courses in drawing and other allied subjects.

**Course Outcomes:**

1. Use of various drawing instruments.
2. Redraw the given figures using geometrical construction.
3. Draw engineering curves with different methods.
4. Draw orthographic and sectional views of the given object.
5. Construct an isometric view from the given views.

**Course Details:**

UNIT	NAME OF THE TOPIC (with Details)	LEARNING OUTCOME	HOURS	MARKS
<b>UNIT NO.1</b> <b>Geometrical construction &amp; tangent</b>	<b>1.1</b> Use of instruments, types of lines, types of letterings, full, enlarging and reducing scales, dimensioning technique.	1. Explain elements of engineering graphics.  2. Draw various types of	<b>10</b>	-



exercises	<p><b>1.2 Geometrical constructions:</b> -</p> <p>To construct a regular polygon of given side.</p> <p>- To construct a regular polygon in a given circle.</p> <p>- To inscribe a circle in a given polygon.</p> <p>- To circumscribe a circle around a given polygon.</p> <p>- To draw circles touching each other and sides of a given polygon internally &amp; externally.</p> <p><b>1.3 Tangent exercises :-</b></p> <p>- To bisect a given straight line/ arc /angle.</p> <p>- To divide a given straight line into given number of equal parts.</p> <p>- To draw a normal to a given straight line/ arc from a given point within or outside it.</p> <p>-To draw a straight line parallel to a given straight line /arc through point/ at a given distance.</p> <p>-To draw an arc touching to two straight lines / two arcs (internally/ externally)/ one line &amp; one arc.</p> <p>- To draw an internal/ external tangent to two given arcs apart from each other.</p>	<p>geometrical constructions in Engineering Graphics.</p> <p>3. Draw various types of tangent exercises in Engineering Graphics.</p>		
<p><b>UNIT NO.2</b></p> <p><b>Redraw Figures &amp; Engineering Curves</b></p>	<p><b>2.1 Redraw figures:</b> - To redraw the given figures (using the knowledge of Geometrical constructions &amp; tangent exercises).</p> <p><b>2.2 Constructions of curves:</b></p> <p>To study the construction of following curves using the method mentioned against them</p> <p><b>Ellipse</b> -Directrix focus method, arcs of circle method &amp; concentric circles method.</p>	<p>1. Redraw figures by using geometrical constructions &amp; tangent exercise.</p> <p>2. Draw Conic curves, &amp; know their applications.</p> <p>3. Draw helix, involute,</p>	<b>06</b>	-

	<b>Parabola-</b> Directrix focus method, rectangle method. <b>Involutes-</b> of a polygon, circle & combination of polygon & circle.			
<b>UNIT NO.3</b>  <b>Orthographic Projections</b>	<b>3.1</b> Conversion of given pictorial views into orthographic projections using First angle and third angle method of projections. Dimensioning the Views.	1. Visualize, interpret & draw orthographic views from given pictorial view.	<b>04</b>	-
<b>UNIT NO.4</b>  <b>Sectional Views</b>	<b>4.1</b> Conversion of given pictorial views into sectional (full sectional) orthographic projections using first angle & third angle method of projections. Dimensioning the views.	1. Visualize, interpret & draw sectional views from given pictorial view.	<b>04</b>	-
<b>UNIT NO.5</b>  <b>Isometric projection &amp; Views</b>	<b>5.1</b> Construction & use of isometric scale. Conversion of given orthographic views into isometric projections/views (objects including curves, slots on sloping planes).	1. Differentiate natural scale and isometric scale. 2. Visualize, interpret & draw isometric view and isometric projection.	<b>06</b>	-
<b>UNIT NO.6</b>	6.1 The ends and thread profiles, Conventional representation of threads, Types of nuts, bolts, washers, set screws. Types of rivet heads and riveted joints. 6.2 Types of sections full, half, revolved, removed offset. 6.3 Conventional breaks for circle and rectangular sections		<b>02</b>	-

#### TEACHING METHODOLOGY:

Chalk-Board, Discussions, Charts, Models.

#### SUGGESTED EXERCISES/PRACTICALS:

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx. Hrs. Required
1.	1	Geometrical construction & tangent exercises	06
2.	2	Redraw figure & Engineering curves.	06
3.	3	Orthographic views.	06
4.	4	Sectional views	04

5.	5	Isometric Views	06
6.	6	Freehand sketches	04
<b>Total</b>			<b>32</b>

### MAJOR EQUIPMENT/INSTRUMENT REQUIRED:

Sr.No.	Equipment Name With Broad Specifications	Exp. Sr. No.
1	Mini drafter	All
2	Solid models	3,4

### SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN:

#### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic and magnetic instruments.
- Arrange a visit to nearby small scale manufacturing unit and make a report of tools and equipments used.
- Use Flash/Animations to explain the working of different instruments.
- Give Mini projects to students.

### SUGGESTED LEARNING RESOURCES

#### O) REFERENCE BOOKS:

SR. NO.	AUTHOR	TITLE	PUBLISHER
1.	N.D. Bhatt	Engineering Drawing	Charotar Publication, Anand.
2.	Mali and Chaudhary	Engineering Drawing	Vrinda Publications, Jalgaon.
3.	Kamat & Rao	Engineering Drawing	Jeevandeep Publicatons, Mumbai
4.	N.Y. Prabhu	Geometrical Engineering Drawing	Pune Vidyarthi Griha, Publications, Pune.
5.	Ozarkar & Utturkar	Engineering Drawing	Maharashtra Publishing House
6.	K. Venugopal	Engineering Drawing	New Age International Ltd., Delhi.
7.	SP 46-1988	Code of practice for general engineering drawing	Bureau of Indian Standards.(BIS)

**MAPPING MATRIX OF PO'S AND CO'S:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	1	2	0	0	1	0	3	1	
CO2	1	0	0	0	1	0	1	1	
CO3	1	0	0	0	1	0	1	1	
CO4	1	2	2	0	1	0	3	1	
CO5	1	3	2	0	1	0	3	1	

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE: WORKSHOP PRACTICE**  
**COURSE CATEGORY: FOUNDATION**

**COURSE CODE: R18ME1205**  
**CREDIT: 02**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
-	2	-	-	-	-	-	50	50

**Rationale:**

Workshop Practice is a basic practical engineering course. The knowledge of basic workshops such as fitting, welding, and sheet metal shop is essential for technician to perform his/her duties in industries. Students are able to perform various operations using hand tool equipment and machineries in various shops. Working in workshop develops the attitude of group working and safety awareness. This course provides miniature industrial environment in the educational institute.

**Course Outcomes:**

1. Select tools and machinery according to job.
2. Use hand tools in different shops for performing different operation.
3. Operate equipment and machinery in different shops.
4. Prepare job according to drawing.
5. Maintain workshop related tools, equipment and machinery.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME
<b>UNIT NO.1</b> <b>Fitting</b>	1.1 Fitting hand tools: bench vice, hammers, chisels, hacksaw, surface plate, try square, marking block, steel rule, twist drill, tap set: use and their specifications.  1.2 Operations of fitting shop machineries- drilling machine and bench grinders: Basic processes- chipping, filing, scraping, grinding, marking, sawing,	1. Explain operations of given fitting machines.  2. Describe the procedure to use given fitting tools.  3. Describe the operation of given machinery  4. Describe the procedure to perform

		fitting operations.
<b>UNIT NO.2</b> <b>Metal Joining</b>	<p>2.1 Arc welding hand tools:electrode holder, cable connector,cable lugs ,chippinghammer,earthing clamp , wire brush and their specifications.</p> <p>2.2 Operation of machineries in welding shops- arc welding transformer their specifications and maintenance.</p>	1. Describe the procedure to identify & use the given metal joining tools.
<b>UNIT NO.3</b> <b>Sheet metal</b>	<p>3.1 Sheet metal hand tools: snipsshears,sheetgauge,straighedge,punches, scribes ,groovers,stakes- their specifications.</p> <p>3.2 Basic process: Marking bending,folding,edging,seaming,riveting.</p>	<p>1. Identify sheet metal tools.</p> <p>Explain operation of sheet metal machineries.</p> <p>2. Describe the procedure to maintain the given sheet metal tools,equipments and machinery.</p>

#### SUGGESTED EXERCISES/PRACTICALS:

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx. Hrs. Required
1.	I	Prepare a sheet metal job using the following operations(tin smithy shop): 1] Cutting & bending 2] Edging 3] End curling 4] lancing 5] Soldering OR riveting	12
2.	II	Prepare a fitting l job using the following operations(fitting): 1]Marking operation as per drawing 2]Punching operation as per drawing 3]Filing operation as per drawing 4] Chamfering operation as per drawing 5] Sawing operation as per drawing 6] Drilling operation as per drawing	12
3.	III	Prepare a job . Fabrication operation involves measuring, marking, cutting, edge preparation, welding.	8
<b>Total</b>			<b>32</b>

**MAJOR EQUIPMENT/INSTRUMENT REQUIRED:**

Sr.No.	Equipment Name With Broad Specifications	Experiment Sr. No.
1	Bench Drilling Machine	I
2	Power saw machine	II & III
3	Bench grinder	II
4	Vernier height gauge	II
5	Surface plate	II
6	Angle plate	II
7	Welding machine	III
8	Bench Vice	II & III
9	Sheet cutting and sheet bending machine	I
10	Fitting Tools: hammers , chisels , files, hacksaw,surface plate,punch, v-block,angle plate,try square,marking block,steel rule,twist drills,reamers,tap set, die set	II
11	Arc welding hand tools – electrode holder,cable connector,cable lugs,chipping hammer , earthing clamp, wire brush.	III
12	Sheet metal hand tools- snip,shears,sheet gauge,straight edge,L-Square,scribe,divider,try square,punches,pliers	I

**TEACHING METHODOLOGY:**

Chalk-Board, Discussions, Charts, Models.

**i) Intellectual Skills:**

- Collection of information, data
- Analysis of data
- Report writing

**ii) Motor Skills:**

- Presentation Skills
- Use of multi media

**SUGGESTED STUDENT ACTIVITIES:**

Other than the classroom and laboratory learning, following are the suggested student related co-curricular activities which can be undertaken to accelerate the attainment of various outcomes in this course:

- Prepare work diary based on practical performed in workshop. Workdiary consist of job drawing, operations to be performed , required raw materials , tools , equipments, date of performance with teacher signature.

**SUGGESTED LEARNING RESOURCES:****P) REFERENCE BOOKS:**

Sr. No.	Title of Book	Author	Publication
1.	Elements of workshop Technology-Volume I & II	S. K. Hajra Chaudhary, Bose, Roy	Media Promoters and Publishers Limited

**Mapping matrix of CO's, PO's AND PSO's:**

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	2	0	2	1	0	1	1	
CO2	3	0	0	2	0	0	1	1	
CO3	3	0	0	0	0	1	1	1	
CO4	3	1	2	0	0	1	1	1	
CO5	3	2	1	2	1	0	1	1	

**3: High 2: Moderate and 1:Low Relationship**



**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE: ELECTRICAL ENGINEERING** **COURSE CODE: R18EE2304**

**COURSE CATEGORY : ALLIED**

**CREDIT : 05**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
3	2	3	80	20	–	–	25	125

**Rationale:**

Diploma engineers come across machines and equipments involving components and devices based on principles of Electrical Engineering. The course envisages study of principles of DC and AC circuits, construction, working and selection of different types of DC and AC motors and transformers.

**Course Outcomes:**

1. Know the principles of magnetic circuits
2. Use single phase ac supply for electrical and electronics equipment.
3. Use three phase ac supply for industrial equipment and machines
4. Connect transformers and DC motors for specific requirements
5. Use FHP motors for diversified applications
6. Use relevant protective devices/ switchgear for different requirements.

**Course Details:**

Unit	Name of the Topic (with details)	Learning Outcome	Hours	Marks
1	<b>Magnetic Circuits:</b> 1.1 Magnetic flux, flux density, magneto motive force, magnetic field strength, permeability, reluctance 1.2 Electric and magnetic circuits 1.3 Series and parallel magnetic circuits 1.4 Faraday's laws of electromagnetic induction, Fleming's right hand rule, Lenz's law 1.5 Statically and dynamically induced emf, self and mutual inductance 1.6 B-H curve and Hysteresis, hysteresis loop	a. State salient features of the given circuits b. Apply Fleming's left hand rule and Lenz's law to determine direction of induced EMF in the given circuit c. Interpret B-H curve and hysteresis loop	07	12

	and hysteresis loss.			
<b>2</b>	<b>A.C.Fundamentals :</b> 2.1 Generation of A.C and D.C quantity, advantages of A.C. Over D.C. 2.2 Sinusoidal A.C wave: instantaneous value, cycle, time period, peak value, average value, r.m.s. value. Frequency, angular frequency for sinusoidal waveform Definition of peak factor and form factor. (No derivation) 2.3 Phasor representation of an alternating quantity. Concept of phase, phase difference, in phase, out of phase quantities. 2.4 Phasor diagram of a sine wave of same frequency, concept of lagging and leading by waveforms 2.5 Pure resistance, inductance and capacitance in ac circuits. 2.6 R-L and R-C series circuits, Impedance and Impedance triangle 2.7 Power factor and its significance, 2.8 Power:-active, reactive and apparent , power triangle	a. State the salient features of AC power supply.  b. Describe the response of the purely resistive, inductive and capacitive AC circuits with sketches.  c. Calculate impedance, current, power factor and power of the given AC circuit.	<b>10</b>	<b>16</b>
<b>3</b>	<b>Polyphase AC Circuits</b> 3.1 Introduction – 1 phase, 2 phase and 3 phase. 3.2 Advantages of 3 phase system over 1 phase system. 3.3 Generation of three phase emf and its waveform, 3.4 phase sequence and balance and unbalance load 3.5 Phase and line voltage , phase and line current & power relations in star and delta connected balanced system and numerical. 3.5 current, power , power factor in a 3 phase balanced system 3.6 Introduction to 3 phase supply systems i.e. star and delta connection and application.	a. Explain the concept of symmetrical system and phase sequence of the given AC supply  b. Distinguish the characteristics of the star or delta connection with sketches.  c. Calculate the current and power of the given 3 phase balanced system	<b>07</b>	<b>12</b>
<b>4</b>	<b>Transformer and DC Motors</b> 4.1. Transformer: working Principle.. E.M.F. equation. Voltage ratio, current ratio, and transformation ratio, losses	a. Explain the working principles of the given type of transformer  b. Distinguish the construction of the given	<b>10</b>	<b>16</b>

	<p>4.2. Phasor diagram of transformer at no load and on load at various P.F. Regulator of a transformer.</p> <p>4.3. Efficiency of transformer. KVA rating of a transformer. Finding efficiency and regulation of a transformer by direct loading &amp; OC,SC test(indirect method)</p> <p>4.5 Auto –transformer: comparison with two winding transformer, applications.</p> <p>4.6 DC motor – Principle of operation</p> <p>4.7 Types of DC motors, Schematic diagram, applications of DC shunt, series and compound motors &amp; their applications</p>	<p>type of transformer.</p> <p>c. Describe the construction and working of the given type of DC motor.</p> <p>d. Select relevant type of DC motor for the given application with justification</p>		
<b>5</b>	<p><b>Fractional Horse Power ( FHP) Motors &amp; other motors</b></p> <p><b>5.1</b> FHP: Schematic representation, principle of operation and application of split phase Induction motors – Types, Constructional details, working,</p> <p><b>5.2</b> Capacitor start capacitor run and permanent capacitor motors shaded pole motors</p> <p><b>5.3</b> Working of 3 phase induction motor. Method to change the direction of rotation of three phase induction motor. Starters. Application of inductance motor. Comparison between squirrel cage &amp; slip ring induction motor.</p> <p><b>5.4</b> Universal Motors: principle of operation, reversal of rotation and applications</p> <p><b>5.5</b> Stepper motor: Types, principle of working. Characteristics of stepper motor, Application stepper motors.</p>	<p>a. Explain the working principle of given type of FHP motor.</p> <p>b. Select relevant type of FHP motor for the given application with justification.</p> <p>c. describe the procedure to connect stepper motor for the given application with sketches</p>	<b>7</b>	<b>12</b>
<b>6</b>	<p><b>Protective Devices and Switchgear:</b></p> <p>6.1 Fuse: operation, types</p> <p>6.2 Compare Switch Fuse Unit and Fuse Switch Unit</p> <p>6.3 MCB,MCCB, and ELCB/RCCB: operation and general specifications</p> <p>6.4 Earthing: importance of earthing, factors affecting earthing</p> <p>6.5 Methods of reducing earth resistance, I.E. rules relevant to earthing</p>	<p>a. select the relevant protective device for the given application with justification</p> <p>b. select suitable switchgear for the given situation with justification</p> <p>c. State the I.E. rule related to be applied for the given type of earthing.</p>	<b>7</b>	<b>12</b>

**SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)**

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Magnetic Circuits:	7	6	4	2	12
2	A.C.Fundamentals	10	8	4	4	16
3	Polyphase AC Circuits	7	4	4	4	12
4	Transformer and DC Motors	10	6	6	4	16
5	Fractional Horse Power ( FHP) Motors	9	2	6	4	12
6	Protective Devices and Switchgear	7	4	2	6	12
	Total	48				80

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**SUGGESTED EXERCISES/PRACTICALS**

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	2	V, I, Power calculations with lamp load for series & parallel circuit combination on AC supply	2
2	2	V,I p.f. & active Power calculation of R,L,C circuit combination.	2
3	2	Line & phase relationship of voltage & current for 3 phase star connection	2
4	2	Line & phase relationship of voltage & current for 3 phase delta connection	2
5	3	To determine efficiency and regulation of a single phase transformer by direct loading.	2
6	3	Single phase Induction motor speed control by electronic method	2
7	3	Speed control of d.c. shunt motor by Armature Voltage control method.	2
8	3	Speed control of d.c. shunt motor by Field Current control method	2
9	4	Study of D.C. shunt motor starter & starting & reversing of a D.C. shunt motor.	2
10	4	Study of Three Phase Transformer Measurement of voltage ratios of Three phase transformer for various types of connections	2
11	4	Study of a 1 phase induction motor (starting & reversing)	2
12	5	Study of stepper motor	2
13	5	Identify switches, fuses, switch fuse and fuse switch units, MCB.MCCB and ELCB/RCCB in a circuit.	2

<b>14</b>	<b>6</b>	Connect the switches; fuses switch fuse and fuse switch units, MCB.MCCB and ELCB/RCCB in a circuit.	<b>2</b>
<b>15</b>	<b>6</b>	Use the earth tester and insulation tester	<b>2</b>
<b>Total</b>			

### SUGGESTED STUDENT ACTIVITIES

9. Visit to industry for acquaintance to electrical system.
10. Learn Problem solving skills.

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- vi. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of Electrical system.
- vii. Arrange a visit to nearby small scale manufacturing unit and make a report of different motors, tools and equipments used.
- viii. Use Flash/Animations to explain the working of different transformers, AC and DC motors and different electrical system.
- ix. Give Mini projects to students.

### SUGGESTED LEARNING RESOURCES

#### Q) Books

<b>Sr. No.</b>	<b>Title of Book</b>	<b>Author</b>	<b>Publication</b>
1	Electrical Technology Vo.-I S	B.L.Theraja	Chand Publishing
2	Electrical Technology Vo.-II S	B.L.Theraja	Chand Publishing
3	Electrical Engineering	B.H.Deshmuth	Nirali Prakashan
4	Basic Electrical Engineering	Mittal and Mittal	Mc-Graw Hill
5	Fundamentals of Electrical Engineering	Saxena, S.B. Lal	Cambridge University Press
6	Basic Electrical and Electronics Engineering	Jagathesan V.	Wiley India, New Delhi

#### R) Major Equipment/ Instrument with Broad Specifications:

1. Three phase transformer 3kVA,400/230V 7.5/15A, 50Hz
2. DC Shunt motor, 3hp,220V, 10A
3. Stepper motor
4. MCB, MCCB, RCCB 15A, 230V

#### S) Software/Learning/ [Simulations](#) Websites

**P-Spice, Python,**

**Mapping matrix of PO's and CO's: (with Justification of each cell)**

Course Outcome	Program Outcome							Program Specific Outcome	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	1	-	-	1		
CO2	3	-	-	3	1	-	-		
CO3	3	-	-	3	-	-	-		
CO4	3	1	1	2	1	-	-		
CO5	2	-	2	-	-	1	-	1	
CO6	3	1	2	1	-	-	2		1

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : RENEWABLE ENERGY & ENVIRONMENTAL TECH. COURSE CODE:R18 EX 2501**

**COURSE CATEGORY : Allied**

**CREDIT : 04**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
2	2	-	-	-		@25	25	50

**Rationale:**

It is necessary to study environmental issues to realize how human activities affect the environment .It is important to look for the possible remedies or precautions which need to be taken to protect the environment. The design and application of new techniques to reduce the pollution effects is a challenge to the human being. The extensive use of the energy sources by the human being makes it necessary to understand the renewable resources and its appropriate use very effectively.

**Course Outcomes:**

1. To discuss the types of natural resources.
2. To state the levels of biodiversity and its measures for conservation.
3. To identify different types of environmental pollution and its control measures.
4. To describe the various social issues associated with environment.
5. Enlist various energy sources and state their present scenario in India.
6. To state the solar energy applications and its increasing importance.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS
<b>1 .Natural Resources</b>	1.1Uses of natural resources, over exploitation of resources 1.2 Renewable and Non-renewable resources 1.3 Forest, water Resources 1.4 mineral, Food Resources 1.5 Environment protection acts.	1a.Define natural resources 1b. Identify uses of natural resources 1c.Understand the overexploitation of resources in the environment 1d.To know various acts related to environment conservation	<b>03</b>

<b>2.Biodiversity</b>	2.1Definition of Biodiversity 2.2Levels of biodiversity 2.3Value of biodiversity 2.4Threats to biodiversity 2.5Conservation of Biodiversity	2a. Define biodiversity 2b. State levels of biodiversity 2c. Suggest measures for conservation of biodiversity	<b>03</b>
<b>3.Environmental Pollution</b>	3.1Definition, Classification, sources, effects and prevention of <ul style="list-style-type: none"> <li>Air pollution</li> <li>Water Pollution</li> <li>Soil Pollution</li> <li>Noise Pollution</li> </ul>	3a.Classify different types of pollution 3b. Enlist sources of pollution 3c. State effect of pollution 3d.Identify measures for prevention of pollution	<b>04</b>
<b>4.Social Issues And Environment</b>	4.1 Concept of sustainable development 4.2 Water conservation, Watershed management. Rain water harvesting: 4.3 Climate Change, Global warming, Acid rain, Ozone Layer Depletion, 4.4 E- waste management 4.5 solid waste management	4a. Describe methods of water management 4b. Identify effects of Climate Change, Global warming, Acid rain and Ozone Layer 4c.Discuss threats of E- waste	<b>08</b>
<b>5.Energy sources types</b>	5.1Concept of energy, Law of conservation of energy 5.2 Introduction to non renewable energy sources and renewable energy sources 5.3Comparison between energy sources 5.4 Present scenario in energy crises in India and world	5a. State energy conservation law 5b. Identify various sources of energy and compare them	<b>06</b>
<b>6.Types of Renewable energy sources</b>	6.1 principles of conversion of solar radiation into heat Flat plate collectors and concentric collectors 6.2 Applications of solar energy in Water heating, Space heating and cooling, 6.3Basic principles of wind energy conversion 6.4Basic principle of tidal power 6.5 Introduction to biomass energy 6.6Introduction to Bio Diesel, Bio Mass plant	6a. Define the basic conversion principle of solar energy. 6b. Describe the solar system used in water heating. 6c. State the applications of solar energy 6d. Describe the principle of tidal power generation. 6e. State resources of Biomass energy. 6f. Know Bio Diesel and Bio Mass plant	<b>08</b>



**SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)**

Not applicable

**SUGGESTED EXERCISES/PRACTICALS**

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	I	Demonstration on Use of natural resources and its overexploitation .checking properties of honey (Honey Bees conservation)	02
2	III	Write important provisions of Acts related to Environment/ Air (Prevention and Control of Pollution) Act/Water (Prevention and Control of Pollution) Act/ Wildlife Protection Act/ Forest Conservation Act	02
3	IV	Visit to waste treatment plant and writing report .	02
4	V	Visit to study organic farming/Vermiculture/biogas plant and writing a report on it.	02
5	VI	Case study with a working model on solar street lighting	02
6	VI	Testing of solar plates and parameters measurement	02
7	VI	Report on demonstration of Solar water heating system	02
8	VI	Case study of tidal power plant	02
Total			

**SUGGESTED STUDENT ACTIVITIES**

1. Collect information and understand the role of BEE (Bureau of Energy Efficiency) and MEDA (Maharashtra Energy Development Agency) on energy.
2. Identify various schemes for solid waste management and e-waste.
3. To organise poster exhibition on various environmental issues.
4. TO analyse the report of PUC of vehicles.

**SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

1. Show video/animation film to demonstrate the environmental components

**SUGGESTED LEARNING RESOURCES****T) Books**

Sr. No.	Title of Book	Author	Publication
1	Environmental Studies	Anindita Basak	Pearson Education
2	Environmental Studies from Crises to Cure	R. Rajgopalan	Oxford University Press
3	Environmental Studies	Dr. R. J. Ranjit Daniels, Dr. Jagdish Krishnaswamy	Wiley India

**U) Major Equipment/ Instrument with Broad Specifications**

1. Solar panel parameters measurement
2. Solar lighting system

**V) Software/Learning/ Simulations Websites**

1. [www.downtoearth.org.in](http://www.downtoearth.org.in)
2. [www.nationalgeographic.com](http://www.nationalgeographic.com)
3. Website of bureau of energy and efficiency: [www.bee-india.nic.in](http://www.bee-india.nic.in)
4. <http://www.indiaenvironmentportal.org.in/>

**CO-PO-PSO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO-1	-	-	-	1	2	1	-	-	-
CO-2	1	-	-	-	1	-	-	-	-
CO-3	2	2	1	2	2	1	2	-	-
CO-4	2	2	2	2	2	-	2	1	2
CO-5	1	-	1	-	2	1	1	-	-
CO-6	2	1	2	3	3	1	2	1	2

**3: High 2: Moderate and 1:Low Relationship**

**DIPLOMA PROGRAMME: ELECTRONICS & TELECOMMUNICATION ENGINEERING****COURSE: ENTREPRENEURSHIP DEVELOPMENT PROGRAM      COURSE CODE: R18EX2502****COURSE CATEGORY: ALLIED****CREDIT: 03****Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
2	1		-	-	-	@25	25	50

@ Internal Examination

**Rationale:**

This course consists of topics related to the development of entrepreneurial skills and other details such as Selection of product lines, site selection, financial aspects, personnel management, quality control and creative thinking. The course includes case studies in the related field. The course emphasizes the development of enterprising qualities among young engineers.

**Course Outcomes:**

1. Identify various business opportunities.
2. Analyze selected business idea.
3. Prepare business plan for enterprise.
4. Generate awareness about enterprise management.

**Course Details:**

UNIT	NAME OF THE TOPIC (with Details)	LEARNING OUTCOME	HOURS
UNIT NO.1	1.1 <b>Introduction :</b>  Definition of entrepreneur, concept of entrepreneur and entrepreneurship, Importance of entrepreneur. Types of entrepreneur: Innovating entrepreneur, imitative entrepreneur, Fabian entrepreneur, drone	1. Explain entrepreneur, concept of entrepreneur and entrepreneurship. 2. State characteristics and qualities of entrepreneur. 3. Difference between Entrepreneur and Entrepreneur. 4. Explain Women entrepreneurship with examples.	06

	<p>entrepreneur and according to type of business. Difference between Entrepreneur and Entrepreneur.</p> <p><b>1.2 Entrepreneurial Competencies: -</b> Characteristics of an entrepreneur, qualities of an entrepreneur, competencies of entrepreneur.</p> <p><b>1.3 Women Entrepreneur:</b> Definition, characteristics of women entrepreneur. Causes of limited growth in India, remedies for limited women Entrepreneurship development.</p>	5. Discuss causes of limited growth of Women entrepreneurship.	
<b>UNIT NO.2</b>	<p><b>2.1 Motivation :</b></p> <p>Definition and concept of motivation, types of motivation: affiliation, power, and achievement motivation. Need and importance of achievement Motivation, challenges of motivation, Motivating factors. Theories of motivation: a) Maslow Hierarchy theory, b) Mc Gregory X-Y theory.</p>	<p>1. Explain concept of motivation and types of motivation.</p> <p>2. Explain challenges of motivations.</p> <p>3. Explain theories of motivations.</p>	<b>04</b>
<b>UNIT NO.3</b>	<p><b>3.1 Creativity and Innovation :</b></p> <p>Definition and concept of Innovation, definition and concept of Creativity.</p> <p>Characteristics of creative people. Discussion of various examples with Respect to creativity and innovation.</p>	<p>1. Explain concept of Innovation and Creativity.</p> <p>2. Discuss characteristics of creative people.</p> <p>3. Discuss various examples of Innovation and Creativity.</p>	<b>05</b>

<b>UNIT NO.4</b>	<p><b>4.1 Business Opportunity Search and Scanning</b>          Opportunities available in different sectors such as manufacturing, services and trading.          Classification of opportunities on the following:          - Natural resource based, Demand based, Local industrial based, Service sector based, Export based, Skill based, Off-farm based.</p> <p><b>4.2 Business Idea :</b>            Search for business idea, sources of business idea, ways of generating ideas, Ideas processing &amp; selection (factors affecting product idea).          SWOT Analysis.</p> <p><b>4.3 Sources of Business Idea :</b>            Market survey &amp; techniques, prospective consumers, development in other nation, study of project profile, government organization, trade fair and exhibitions. Checklists for information collection.</p>	<ol style="list-style-type: none"> <li>1. Discuss the Business Opportunities.</li> <li>2. Describe classification of opportunities.</li> <li>3. Explain search and generation of business idea.</li> <li>4. Discuss Sources of Business Idea.</li> </ol>	<b>06</b>
<b>UNIT NO.5</b>	<p><b>5.1 Government and Non-Government Agencies for Promotion and Development:</b>  <b>Importance</b> of funds, Types of funds. Various schemes of assistance of Government, Government policies and incentives.          Registration with various Government agencies, definition of SSI and Ancillary.</p>	<ol style="list-style-type: none"> <li>1. Discuss Government and Non-Government Agencies associated with entrepreneurship.</li> <li>2. State importance of funds and government fund schemes.</li> <li>3. Explain SSI and Ancillary.</li> </ol>	<b>05</b>
<b>UNIT NO.6</b>	<p><b>6.1 Business Plan Preparation :</b>            Project identification, project formulation, feasibility analysis, Estimation of cost of production, Cost volume profit relationship at different levels, Interpretation of financial statements, Institutionalized and No institutionalized sources of working capital, Funds flow statements, Loan application form for appraisal. Project report preparation.</p>	<ol style="list-style-type: none"> <li>1. Explain concept of Business Plan.</li> <li>2. Explain project formulation and analysis.</li> <li>3. State sources of capital.</li> <li>4. Calculate cost of production.</li> <li>5. Describe cost volume profit relationship.</li> <li>6. Calculate cost of production.</li> <li>7. Discuss loan application form for appraisal.</li> </ol>	<b>06</b>

**SUGGESTED EXERCISES/PRACTICALS:**

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx. Hrs. Required
1.	I	Biography of any entrepreneur	02
2.	I	Self Disclosure Exercise (Who am I?)	02
3.	II	Self rating questionnaire.	02
4.	III	Thematic Appreciation Test (TAT)	02
5.	III	Ring Toss Exercise	04
6.	III	Tower Building Exercise	04
7.	II	Convince and Crown	02
8.	III	Creativity and Problem solving	02
<b>Professional exercises</b>			
9.	IV	Walking through Market	04
10.	V,VI	Business plan preparation	04
11.	I,V,VI	Interview of a successful entrepreneur	02
12.	I	Interview / Biography of a successful women entrepreneur	02
<b>Total</b>			<b>32</b>

**MAJOR EQUIPMENT/INSTRUMENT REQUIRED:**

Sr. No.	Equipment Name With Broad Specifications	Exp. Sr. No.
1.	LCD Projector	ALL
2.	Rings, Pegs, Line Marker	5
3.	Work Table	5,6
4.	Wooden Blocks, Sticks	6

**SUGGESTED STUDENT ACTIVITIES:****TEACHING METHODOLOGY:**

Chalk Board, Discussions, Power Point Presentations, Transparencies, Visits, Charts.

**i) Intellectual Skills:**

- Identify various opportunities in market.
- Identify individual's entrepreneurial competencies.
- Interpret risk to be taken during a task.
- Interpret SWOT of individual.
- Prepare a report of business plan.

- Enhance/Improve presentation and writing skills.

## ii) Motor Skills:

- Presentation Skills
- Use of multi media

## SUGGESTED LEARNING RESOURCES:

### W) REFERENCE BOOKS:

SR. NO.	AUTHOR	TITLE	PUBLISHER
1.	Vasant Desai	Dynamics Of Entrepreneurial Development And Management.	Himalaya Publishing House, 1997, Reprint-1999.
2.	Dilip M. Sarwate	Entrepreneurial Development Concept and Practices	Everest Publishing House, 1996
3.	Gupta Srinivasan	Entrepreneurial Development	Sultan Chand & Sons, 1993.
4.	D. D. Mali	Training of Entrepreneurship and Self Employment.	Mittal Publications, 1999.

### MAPPING MATRIX OF CO'S AND PO'S:

CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2
CO1	-	3	-	1	2	-	1	-	-
CO2	1	1	2	1	1	-	1	-	-
CO3	2	1	-	1	1	-	1	-	-
CO4	-	2	-	-	2	-	-	-	-

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY, PUNE - 1**

**DIPLOMA PROGRAMME: CIVIL/ MECH./ELECT./COMP/ ELEX. ENGINEERING**

**COURSE : ELEMENTS OF ACCOUNTS AND FINANCE COURSE CODE: R18EX2503**

**COURSE CATEGORY: ALLIED**

**CREDITS: 3**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS	TH	TEST	PR	OR	TW	TOTAL
2	1 (T)	-	-	-	--	@25	25	50

**Rationale:**

The aim of this course is to provide with the basic level skills and knowledge required by engineers in the accounting and finance. The curriculum envisages the elementary theory and practice of financial accounting. This involves understanding of the concepts and choices that underline measurement and disclosure in financial statements.

**Course Outcomes**

1. acquire knowledge of basic concepts of accounting
2. acquire basic accounting knowledge
3. interpret the financial statements

**Course Details:**

UNIT	NAME OF THE TOPIC	HOURS	MARKS
1	<b>Introduction to Book-keeping and Accountancy</b>  Meaning & definition, objectives, importance and utility, Difference between Book-keeping and Accountancy.  Basis of accounting: Cash basis and accrual basis  Branches of accounting: Financial , Cost, management  Accounting terminology: Business transactions- Cash, Credit, Non-monetary transactions  Types of assets- Fixed, Current, Fictitious  Types of liabilities: Fixed, Current, Contingent	5	



	<p>Net worth, Capital, Debtor, Creditor, Expenditure,</p> <p>Types of Expenditure: Capital, Revenue, Deferred revenue</p> <p>Solvent- insolvent</p>		
2	<p><b>Fundamentals of double entry book-keeping:</b></p> <p>Principles, Comparison between conventional and double entry system, Classification of accounts: Personal, Real, Nominal</p> <p>Meaning of debit and Credit</p> <p>Basic rules for debit and credit for different accounts</p>	6	
3	<p><b>Journal:</b> Definitions, Importance and utility of journal, Specimen of a journal, Journalizing and steps for journalizing</p> <p>Ledger: Meaning, need and contents of ledger, specimen of ledger account, posting of entries in ledger</p> <p>Balancing of ledger accounts</p>	8	
4	<p><b>Trial Balance:</b></p> <p>Meaning and purpose</p> <p>Specimen of trial balance, preparation of trial balance from given balances of accounts, introduction to errors and their rectification methods</p> <p>Depreciation: causes and need, methods of computing depreciation</p> <p>Provisions and reserves: Meaning and objectives</p>	3	
5	<p><b>Final Accounts:</b></p> <p>Financial statements, preparation of profit and loss account, trading account, Valuation of stock, provisions for bad debts,</p> <p>Balance sheet: Arrangements of assets and liabilities</p> <p>Accounting standards:</p>	5	
6	<p><b>Cash flow and fund flow statements</b></p> <p>Difference between cash flow and fund flow statement, advantages and limitations</p> <p>Ratio analysis: current ratio, return on equity, the debt-equity ratio, the dividend payout ratio and the price/earnings (P/E) ratio</p>	5	

**Teaching Methodology:** Discussions, Chalk-Board, Charts, and Transparencies.

**Term Work:**

**List of Assignments:**

1. Minimum Two exercises on Journalizing
2. At least two assignment on posting entries into Ledger
3. Preparation of Trial Balance,
4. Interpreting a Profit and Loss Account / Income and Expenditure statement
5. Reading a Balance Sheet
6. Exercise on Cash flow statement
7. Finding financial ratios from Balance sheet and interpreting them
8. Reading and interpreting financial Statement of a Private/Public Limited Company

**Specification table for question paper design:**

Unit No.	Unit Title	Teaching Hours	Distribution of Marks			
			R Level	U Level	A Level	Total
1	Introduction to Book-keeping and Accountancy	5				
2	Fundamentals of double entry book-keeping:	5				
3	Journal:	6				
4	Trial Balance:	6				
5	Final Accounts:	5				
6	Cash flow and fund flow statements	5				
	TOTAL	32				

**Teaching Methodology:**

Chalk Board, Discussions, Power Point Presentations, Videos, Visits, Charts.

**i) Intellectual Skills:**

- Understand functions of accounting and finance required for various departments.
- Understand the principles of accounting and finance and role in organization.
- Apply different accounting techniques in industry.

**Learning Resources:****Books:**

<b>SR.NO.</b>	<b>AUTHOR</b>	<b>TITLE</b>	<b>PUBLISHER</b>
1	T.S. Grewal S.C. Gupta	Introduction to accountancy	S. Chand Publications, New Delhi
2	-	Book-keeping and Accountancy For Std XI And XII	Maharashtra State Board Of Secondary And Higher Secondary Education

**Mapping Matrix of CO's, PO's and PSO's:**

<b>CO's</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	1	1	-	-	1	2	2	-	2
<b>CO2</b>	1	1	-	-	1	2	3	-	2
<b>CO3</b>	1	-	-	-	1	2	3	1	1
<b>CO4</b>	2	-	-	-	1	2	3	1	1
<b>CO5</b>	2	1	-	-	1	2	3	1	1
<b>CO6</b>	1	2	-	-	1	3	3	2	2

**3: High 2: Moderate and 1: Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: MECHANICAL ENGINEERING**

**COURSE: INDUSTRIAL ORGANIZATION AND MANAGEMENT COURSE CODE: R18EX 2504**

**COURSE CATEGORY: ALLIED**

**CREDIT: 04**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	-	4	80	20	--	--	--	100

**Rationale:**

Engineer has to work in Industry with man and machines and material as resources. Therefore, managerial skills and abilities are essential for enhancing their employability and career growth. This course is therefore designed to provide the basic concepts in business organization & management. This course is classified under human sciences and is intended to teach students about structure of organization and its management, types of organization, principles of management and process, Management and functioning of various departments, Industrial safety & Industrial Acts.

**Course Outcomes:**

1. Overview of business and understand business organization and management processes.
2. Know types of business organization structures, organizational principles, departmentation and types of ownerships.
3. Identify different human resources and its management. Know different acts, wages, and incentives, safety measures for execution in Industry.
4. Understand financial resources and its management.
5. Identify different sources of material and its storage management.
6. Understand marketing management & use project management techniques.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MAR KS
<b>UNIT NO.1</b>  <b>Business Organization &amp; Management Processes</b>	<b>1.1 Types of business:</b> Service industry, manufacturing industry, trading industry. <b>1.2 Industrial sectors:</b> Types and features of- engineering industry, process industry,	1. Lists different business trends of Industry. 2. Explain characteristics, nature of each business with suitable example. 3. Explain various industrial sectors with its product nature.	<b>10</b>	<b>12</b>

	<p>textile, chemical, agriculture, information technology, banking, insurance, retail, hospitality, automobiles, paper, cement ,petro chemical, sugar, steel and healthcare etc.</p> <p><b>1.3 Emerging trends in business:</b> Industry 4.0 revolution and Smart Manufacturing, globalization and its effect.</p> <p><b>1.4 Management:</b> Concept, definitions, levels, administrator &amp; management, scientific management.</p> <p><b>1.5 Principles of management:</b> 14 principles of Henry Fayol.</p> <p><b>1.6 Functions of management:</b> Planning, organizing, staffing, directing and controlling.</p>	<ol style="list-style-type: none"> <li>Describe nature of smart manufacturing as emerging trends in business Industry.</li> <li>Justify globalization and its effect on Indian market.</li> <li>Define the Management term and list different level of management.</li> <li>Explain role of the different level of management.</li> <li>Differentiate between management &amp; administration.</li> <li>Compare between conventional and scientific management.</li> <li>Enlist and describe Henry Fayol 14 principles of management.</li> <li>State and explain functions of management with suitable example.</li> </ol>		
<p><b>UNIT NO.2</b></p> <p><b>Organizational Management</b></p>	<p><b>2.1 Organization:</b> Definition, steps in organization formation .</p> <p><b>2.2 Types of organization structure:</b> Line, staff, line and staff.</p> <p><b>2.3 Departmentation:</b> Formed by product, by functions &amp; by process.</p> <p><b>2.4 Principles of organization:</b> Authority and responsibility, centralization and decentralization of authority, span of control, balance, stability and flexibility, communication.</p> <p><b>2.5 Forms of ownership:</b> Proprietorship, partnership, Joint stock (private Ltd, public Ltd), co-operative society, Government sector- Govt. dept, public corporation, public company.</p>	<ol style="list-style-type: none"> <li>Define the term organization.</li> <li>Explain the steps in organization formations.</li> <li>Describe different types of organization with respect to its nature, characteristics etc.</li> <li>Differentiate between line &amp; staff types of organization.</li> <li>Explain the concept of departmentation.</li> <li>State and explain different types of departments.</li> <li>Describe various principles of organization with suitable example.</li> <li>Classify different forms of ownership with diagram.</li> <li>Explain different forms of ownerships with respect to its nature, characteristics, advantages, limitations.</li> </ol>	<b>10</b>	<b>12</b>

<b>UNIT NO.3</b>  <b>Human Resource and Management</b>	<b>3.1.Personnel management:</b> Definition, functions, man power planning, source of employment, recruitment & selection procedure, employee testing methods, training methods, qualities and duties of supervisor. Morale-advantages, methods to improve morale. Motivations-definition and need, types. <b>3.2.Wages:</b> Definition, types, characteristics of good wages, wage payment plan & types. <b>3.3.Incentives:</b> Definition, types, incentive plans. <b>3.4.Legislative Acts:</b> Needs, factory act, employee compensation act, industrial dispute act, minimum wages acts. <b>3.5.Industrial accidents &amp; safety:</b> Causes of accidents, types, effects of accidents, preventive measures, safety procedure & programme.	1. Define the personnel management. 2. State the functions of personnel management in organization. 3. Describe men power planning for different department. 4. Write different source of employment. 5. Explain recruitment and selection procedure for employee. 6. State and describe various testing & training methods of employee. 7. Justify qualities and duties of supervisor. 8. Write advantages of morale. 9. State methods for improvement of morale. 10. Explain various types of motivations. 11. Describe characteristics of good wage plan and its types. 12. Write various types of incentive plans. 13. Explain various industrial acts. 14. Write causes, effect, types of industrial accidents. 15. Explain preventive measure, safety procedure & programme.	<b>12</b>	<b>16</b>
<b>UNIT NO.4</b>  <b>Financial Management</b>	<b>4.1.Financial Management:</b> Definition, objectives, functions. <b>4.2.Capital Generation:</b> Types of capital, sources of raising capital. <b>4.3.Budgets:</b> Types of budgets-production, sales, cash, labour, material and financial budget. <b>4.4.Accounts:</b> Types of account- profit& loss account, balance sheet, financial ratios. Terminology –Book keeping & accounting, journal, ledger, liability and assets etc. <b>4.5.Taxes:</b> Types of taxes, meaning and example of excise,	1. Define term ‘Financial management. 2. State and explain objectives and functions of financial management. 3. Differentiate between fixed capital and working capitals. 4. State and explain various source of raising the finance. 5. Describe different types of budgets. 6. Enlist various types of accounts with example. 7. Justify profit &loss accounts with sample balance sheet. 8. State and explain various financial ratios and its purposes in company.	<b>12</b>	<b>16</b>

	service tax, income tax, value added tax, custom duty, goods service tax (GST).	9. Explain the terminology used in account. 10. Classify the various taxes, explain the meaning of each taxes used in business.		
<b>UNIT NO.5</b>  <b>Material Management</b>	<b>5.1.Inventory Management:</b> Inventory-concept, classification, functions, objectives of inventory managements. <b>5.2.ABC analysis:</b> Concept and necessity, graphical representation, advantages and limitations. <b>5.3.Economic order quantity:</b> Concept EOQ, graphical representation, determination of EOQ, buffer stock, advantages and limitations, numerical. <b>5.4.Purchasing:</b> Objectives, functions of purchase department, purchasing procedure. <b>5.5.Industry4.0 Techniques of Material Management:</b> Technology used in Smart Manufacturing(SM) for material management – material resource planning (MRP) module ,enterprise resource planning (ERP)module, internet of thing (IoT) and digital transformations (DT),and its advantages.	1. Explain the concept inventory. 2. Classify and state various functions of inventory. 3. List various objectives of inventory management. 4. Describe concept and need of ABC analysis. 5. Show the graphical representation of ABC analysis. 6. Write advantages and limitations of ABC analysis. 7. Explain concept of EOQ with graphical representation. 8. Define buffer stock. 9. State advantages and limitations of EOQ. 10. Solve simple numerical based on EOQ calculation. 11. Describe objectives & functions along with purchasing procedure. 12. State and explain Industry 4.0 techniques of material management. 13. Justify use of internet of things (IoT) & digital transformation (DT) with its advantages.	<b>10</b>	<b>12</b>

<b>UNIT NO.6</b>  <b>Sales/ Marketing Management &amp; Project Management</b>	<b>6.1.Sales Management:</b> Sales-definition, functions & duties of sales managers. <b>6.2.Marketing Management:</b> Marketing-definition, functions. Marketing management-definition and functions. Market research- definition, objectives and scope. Market- concept, types. <b>6.3.Advertising:</b> Definition, agency and types. <b>6.4.Project Management:</b> Network analysis- Definition, list of network analysis technique, objectives and advantages. Terminology in network analysis- events, activity, path, network diagram, critical path, duration, dummy activity, construction of network diagram for project. <b>6.5.CPM:</b> Concept, characteristic, applications and simple numerical. <b>6.6.PERT:</b> Concept, characteristics, applications, simple numerical on PERT.	1. Define sales; also write functions & duties of sales managers. 2. Define marketing. State the functions of marketing. 3. Define marketing management. State the functions of marketing management. 4. Define market research. State its objectives and scope. 5. List & explain various types of markets. 6. Define advertising; also state its agency and types. 7. Define network analysis & and its various techniques. 8. Write objective and advantages of network analysis. 9. Explain various terminology used in network analysis. 10. Draw network diagram and show events, activity, critical path, duration, dummy activity. 11. Explain concept of CPM. State its important characteristics and applications. Solve numerical on CPM. 12. Explain concept of PERT. State its important characteristics and applications. Solve numerical on PERT. Compare CPM and PERT.	<b>10</b>	<b>12</b>
<b>TOTAL</b>			<b>64</b>	<b>80</b>



**Specification table for question paper design:**

Unit No.	Unit Title	Teaching Hours	Distribution of Marks			
			R Level	U Level	A Level	Total
1	Business Organization & Management Processes	10	4	4	4	12
2	Organizational Management	10	4	4	4	12
3	Human Resource and Management	12	4	8	4	16
4	Financial Management	12	4	8	4	16
5	Material Management	10	4	4	4	12
6	Sales/ Marketing Management & Project Management	10	4	4	4	12
	<b>TOTAL</b>	<b>64</b>	<b>24</b>	<b>32</b>	<b>24</b>	<b>80</b>

**Teaching Methodology:**

Chalk Board, Discussions, Power Point Presentations, Videos, Visits, Charts.

**i) Intellectual Skills:**

- Understand functions and managerial skills required for various departments.
- Understand the principles of management and role of management in organization.
- Apply different project management techniques in industry.

**Suggested Learning Resources:****Reference Books:**

SR.NO.	AUTHOR	TITLE	PUBLISHER
1	Dr. O.P. Khanna	Industrial Engineering & Management.	Dhanpat Rai & Sons.
2	J. R. Batliboi	First Steps in Book Keeping.	
3	Dr. B. C. Punmia and K. K. Khandelwal	Project Planning and Control with CPM and PERT.	Laxmi Publication.

**Mapping Matrix of CO's, PO's and PSO's:**

<b>CO's</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	1	1	-	-	1	2	2	-	2
<b>CO2</b>	1	1	-	-	1	2	3	-	2
<b>CO3</b>	1	-	-	-	1	2	3	1	1
<b>CO4</b>	2	-	-	-	1	2	3	1	1
<b>CO5</b>	2	1	-	-	1	2	3	1	1
<b>CO6</b>	1	2	-	-	1	3	3	2	2

**3: High 2: Moderate and 1: Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : NETWORK THEORY COURSE CODE: R18 EX3501**  
**COURSE CATEGORY : CORE CREDIT : 06**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	2	3	80	20	-	-	50	150

**Rationale:**

The subject gives information of the basic circuit elements and network theorems . There are many different techniques for calculating voltages across, and the currents through every component in the network. The analysis of circuit parameters forms the base for design of various electronic circuits.

**Course Outcomes:**

1. To apply network simplification techniques for the reduction of complicated networks .
2. To apply network theorems for calculating circuit parameters.
3. To calculate parameters for a two port network.
4. To investigate the frequency response characteristics of series and parallel resonant circuits.
5. To design filter for intended application
6. To analyse the correlation of parameters of a transmission line.

**Course Details:**

NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
<b>Unit1 Network Parameters</b>  1.1 Basic components R, L, C, series and parallel combination, Examples 1.2 Sources AC, DC-voltage and current 1.3 Current and voltage division rule 1.4 Terms related to network topology 1.5 Kirchoff's voltage law, Examples 1.6 Kirchoff's current law, Examples . 1.7 DC analysis of RL,RC circuit – voltage and current Relations 1.8 AC analysis of RL,RC circuit – current and voltage relations 1.9 Time constant concept 1.10 Energy stored in L, C, Time constant	1a. Determine voltage and current for R, L and C connected in series, parallel combination 1b. Identify the type of voltage and current source 1c. state and Explain equation for kirchoff's laws 1d. Describe the response of RC and RL circuit to ac and dc voltage 1e. Explain in energy	<b>10</b>	<b>12</b>

concept	stored in C and L.		
<b>Unit2 Network Theorems</b>  2.1 Mesh analysis, Examples 2.2 Nodal analysis, Examples 2.3 Superposition theorem 2.4 Thevenin's theorem, 2.5 Norton's theorem, 2.6 Maximum Power Transfer theorem, Examples based on DC) 2.7 Principle of duality 2.8 Circuit reduction and conversion (T to $\pi$ ) and ( $\pi$ to T)	2a.Solve the resistive circuit to determine voltage and current using KVL and KCL 2b. Use Superposition theorem to calculate the value of current in any branch of the network. 2c. Explain the steps to obtain thevenin's and Norton's equivalent circuit for the given network 2d. Describe the condition of maximum power transfer for a given circuit 2f.Draw the dual of the given network 2g To convert (T to $\pi$ ) and ( $\pi$ to T)	<b>10</b>	<b>12</b>
<b>Unit3 Two port Network</b> 3.1 Two port network types 3.2 Symmetrical networks-characteristics impedance propagation constant, Attenuation constant. 3.3 Asymmetrical network –iterative impedance, image impedance. 3.4 Attenuator: Definition, Application, units 3.5 Symmetrical, Asymmetrical- T type, $\pi$ type, 3.6 Lattice, Bridged T,L type 3.7 Numericals on designing attenuator 3.8 Z parameters, condition for symmetry and Reciprocity 3.9 Y parameters, condition for symmetry and Reciprocity 3.10 h parameters, condition for symmetry and Reciprocity 3.11 Transmission parameters, condition for symmetry and Reciprocity	3a. Define properties of symmetrical and asymmetrical network 3b. Classify various types of attenuators 3c. To list the units of attenuation 3d. To solve the given network for obtaining Z,Y,h,T parameters 3e. To state the condition of symmetry and reciprocity for network parameters	<b>12</b>	<b>16</b>
<b>Unit4 Resonance circuits</b>	4a. Define Q factor of coil and Capacitance 4b. Determine the value	<b>10</b>	<b>12</b>

<p>4.1 Introduction to Resonance - series and parallel</p> <p>4.2 Q factor of L and C (derivation)</p> <p>4.2 Calculations for resonant frequency &amp; bandwidth for series resonant circuit</p> <p>4.3 Calculations for resonant frequency &amp; bandwidth for parallel resonant circuit.</p> <p>4.4 Comparison of series and parallel resonance circuits.</p> <p>4.5 Coupled circuits &amp; it's analysis.</p> <p>4.6 Untuned, Tuned, doubled tuned – coupled circuits, effect of K.</p>	<p>of resonant frequency</p> <p>4c. Draw the response of various parameters with frequency.</p> <p>4d. Describe the tuned and untuned circuits</p>		
<p><b>Unit5 Filters</b></p> <p>5.1 Pole &amp; Zero concept for network</p> <p>5.2 plotting of poles and zeros of Simple transfer function</p> <p>5.3 Filter fundamentals:- pass band, stop band.</p> <p>5.4 Classification of filters and types -constant k and m derived</p> <p>5.5 Design of constant k low pass filter</p> <p>5.6 Design of constant k high pass filter</p> <p>5.7 Design of constant k band pass filter</p> <p>5.8 Design of constant k band stop filter</p> <p>5.9 Concept of cut off frequency, phase, attenuation</p>	<p>5a. Draw a pole zero plot for the given transfer function</p> <p>5b. Classify various passive filters</p> <p>5c. Label pass band, stop band and attenuation band on the characteristics .</p> <p>5d. Apply the equations for cut-off frequency to calculate values of L,C</p> <p>5e. Draw the frequency response of all the filters</p>	<b>12</b>	<b>16</b>
<p><b>Unit6 Transmission line</b></p> <p>6.1 Transmission line –Introduction, equivalent circuit, 6.2 Equations of primary and secondary constants</p> <p>6.3 Equation of transmission line, V, I relation,</p> <p>6.4 characteristic impedance, relation between primary and secondary constants</p> <p>6.3 Concept of VSWR, standing waves.(no derivation)</p> <p>6.4 Numericals.</p> <p>6.5 Various types of Transmission lines with their applications</p>	<p>1a. Draw the equivalent circuit of transmission line.</p> <p>1b. Explain the equations relating primary and secondary constants.</p> <p>1c. Explain the standing waves and VSWR</p> <p>1d. List various types of transmission lines and their applications</p>	<b>10</b>	<b>12</b>

**SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)**

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Network Parameters	10	04	06	02	12
2	Network Theorems	10	04	04	04	12
3	Two port Network	12	04	08	04	16
4	Resonance circuits	10	02	06	04	12
5	Filters	12	08	04	04	16
6	Transmission line	10	02	06	04	12
	<b>Total</b>	<b>64</b>	24	34	22	<b>80</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**SUGGESTED EXERCISES/PRACTICALS**

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	I	To measure the series & parallel combination of Resistors on DC circuit.	02
2	I	To verify Kirchoff's voltage law and Kirchoff's current law	02
3	I	To observe and plot the response of AC signal on RC circuit	02
4	II	To verify Superposition theorem	02
5	II	To verify Thevenin's theorem, Norton's theorem	02
6	II	To verify Maximum power transfer theorem	02
7	III	To measure and calculate Z, Y, h parameters for a Two port network	02
8	IV	To plot the characteristics of Series resonance circuit. - resonance frequency, bandwidth & Q factor	02
9	IV	To plot the characteristics of Parallel resonance circuit. - resonance frequency, bandwidth & Q factor	02
10	V	To built and test Low Pass & High Pass Filter	02
<b>Total</b>			<b>20</b>

**SUGGESTED STUDENT ACTIVITIES**

11. Implementation of small circuits on breadboard
12. Assignments based on each unit

**SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

- b. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic circuits (Transmission lines).
- c. Give Mini projects to students.

## SUGGESTED LEARNING RESOURCES

### X) Books

Sr. No.	Title of Book	Author	Publication
1	A Text Book of Electrical technology	B.L.Theraja	S. Chand & Co.
2	Network Lines and Fields	J.D.Rayder	Prentice Hall Publication
3	Networks and Systems	D.Roy Choudhary	New age International Publication

### Y) Major Equipment/ Instrument with Broad Specifications

Sr. No.	Equipment/ Instrument with Broad Specifications
1	Variable DC power supply 0-30V,2A
2	Cathode Ray Oscilloscope Dual Trace 20MHz
3	Function Generator 0-1MHz with Sine, Square, triangular output with variable amplitude and frequency
4	Digital Multimeter 3 1/2 digit display,9999 counts
5	Bread board 840-1000 contact points
6	Trainer boards and kits for experiments
7	LCR Q meter

### Z) Software/Learning/ [Simulations](#) Websites

- 1) [www.nptel.com](http://www.nptel.com)
- 2) [www.electronics-tutorials.com](http://www.electronics-tutorials.com)

**CO-PO/PSO MAPPING**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO-1	3	2	3	2	-	1	3	3	3
CO-2	3	2	2	3	2	2	2	2	2
CO-3	2	2	2	2	1	2	2	2	2
CO-4	2	2	2	2	1	1	2	2	2
CO-5	2	2	2	2	2	2	3	2	2
CO-6	2	2	3	2	1	1	2	2	2

**3: High 2: Moderate and 1:Low Relationship**



**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE: SEMICONDUCTOR DEVICES & CIRCUITS COURSE CODE: R18EX3502**

**COURSE CATEGORY: CORE**

**CREDIT : 6**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	2	3	80	20	@25	-	50	175

**Rationale:**

Electronics is the major part of our day to day life. In each and every field electronic systems are used. The Semiconductor Devices & Circuits is one of the subjects which are the base of all advance electronics. It starts with PN - junction Diode, BJTs, which makes the student to follow the functioning of electronic devices & Circuits. It intends to teach the operating principle and application of electronic circuits like amplifiers, regulators.

**Course Outcomes:**

1. Test semiconductor diodes, bipolar junction transistor and photo devices using electronic instruments.
2. Analyze the different types of wave shaping circuits.
3. Evaluate the characteristics of bipolar junction transistor.
4. Troubleshoot the problems in circuits designed using diodes, bipolar junction transistor and passive components.
5. Use relevant diode and BJT in electronics circuits.

**Course Details:**

NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
<b>Semiconductor Diodes</b> 1.1 P.N. Junction Diodes Working principle- Forward bias and Reverse bias circuit diagram of characteristic of PN junction diode, Static & dynamic resistance, specification, forward voltage drop, maximum forward current power dissipation. 1.2 Zener diode Constructional diagram, symbol, circuit diagram and characteristics of Zener diode Specification: Zener voltage, power dissipation, dynamic resistance 1.3 Special Diodes Construction, symbol & applications of PIN diode, Schottky diode, Tunnel diode	1a. Explain working principal of PN junction diode 1b. Solve problems based on Simple diode circuits. 1c. Explain working principal of Zener diode 1d. Compare the specifications of PN Junction and Diodes. 1e. Compare the specifications of Special Diodes.	08	12

<p><b>Uncontrolled Rectifiers and Filters:</b></p> <p>2.1 Rectifiers Need of rectifiers. Types of rectifiers: HWR, FWR (bridge and centre tap) circuit operation I/O waveforms for voltage &amp; current Parameters of rectifier Average DC value of current &amp; voltage, ripple factor, ripple frequency, PIV of diode, TUF, efficiency of rectifier. Comparison of three types of rectifiers</p> <p>2.2 Filters Need of filters Circuit diagrams, operation and input-output waveforms of following types of filters</p> <ul style="list-style-type: none"> <li>• Shunt capacitor</li> <li>• Series inductor</li> <li>• LC filter</li> <li>• <math>\pi</math> filter</li> </ul> <p>2.3 Numerical examples based on parameters of rectifiers</p> <p>2.4 Regulators Need of Regulators Circuit diagram of Zener Diode as Regulator operation.</p>	<p>2a. Explain working principal of Rectifiers, Filter and Regulator Circuits.</p> <p>2b. Solve problems based on Rectifiers, Filter and Regulator Circuits.</p> <p>2c. Compare types of Rectifiers and Filter Circuits.</p> <p>2d. Explain the procedure to troubleshoot Rectifiers and Filters.</p>	12	16
<p><b>Wave shaping Circuit</b></p> <p>3.1 Linear wave shaping circuit Need of wave shaping circuits, comparison between linear and non-linear wave shaping circuits Operations of wave shaping circuits Linear circuits: RC Integrator &amp; differentiator</p> <p>3.2 Non linear wave shaping circuits Circuit diagram, operation, waveforms of different types of clippers using diodes: series, shunt, (biased and unbiased) Circuit diagram, operation, waveforms of different types of clippers: positive and negative</p> <p>3.3 Voltage multiplier – voltage doubler, tripler and quadrupler.</p>	<p>3a. Distinguish the term: Linear Wave Shaping, Non Linear Wave Shaping</p> <p>3b. Explain the working principal of Linear and Non Linear Wave Shaping circuits.</p> <p>3c. Compare Clipper and Clamper.</p> <p>3d. Explain the working principal of Voltage Multiplier.</p> <p>3e. Explain the procedure to troubleshoot Wave shaping circuits.</p>	12	12

<b>Bi-polar Junction Transistors:</b> 4.1 Introduction: Basic concept, Types of transistors, operation, Configuration (CB, CC & CE) & its input-output characteristics, Comparison between CB, CC & CE, Transistor as switch	4a. Explain the basic concept and working of BJT.  4b. Compare CB, CE and CC configuration of Transistor  4c. Solve the numerical based on characteristics of Transistor.  4d. Explain the working principal of Transistor as switch.	10	12
<b>BJT Biasing &amp; Voltage Amplifier:</b> 5.1 Need for biasing, Concept of DC load line, Operating point (Q), stabilization, thermal runaway Types of biasing i. Fixed biasing circuits. ii. Base biased with emitter feedback. iii. Voltage divider 5.2 Characteristics of an ideal Voltage Amplifier with specifications, voltage and current gain. 5.3 Amplifiers- CE, CB, CC Circuits. 5.4 Single stage AF amplifier, $A_v$ , $A_i$ , $Z_{in}$ , $Z_o$ . 5.5 Multistage amplifier- RC coupled amplifier circuit diagram, Working.	5a. Distinguish the terms: Operating point (Q), stabilization, thermal runaway 5b. Explain the working principal of Transistor Biasing 5c. Compare CB, CE and CC Transistor Amplifiers.  5d. Solve the numerical based on Transistor Amplifiers. 5e. Explain the procedure to troubleshoot amplifiers.	14	16
<b>Photo Devices:</b> 6.1 Construction, symbol, operating principle, characteristic & applications LED IRLED Photodiode Laser diode Photo transistor LASCR 6.2 Opto-couplers : Construction, symbol, operating principle & applications.	6a. Distinguish the terms: Photo Sensitive and Photo Generating Devices 6b. Explain working principal of LED & IRLED. 6c. Explain working principal of Photo diode & transistor. 6d. Compare the specifications of laser diode and LASCR. 6e. Explain working principal of Opto-couplers.	08	12
Total		64	80

**SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)**

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Semiconductor Diodes	08	2	4	6	12
II	Uncontrolled Rectifiers and Filters	12	2	6	8	16
III	Wave shaping Circuit	12	2	4	6	12
IV	Bi-polar Junction Transistors	10	4	4	4	12
V	BJT Biasing & Voltage Amplifier	14	2	6	8	16
VI	Photo Devices	08	2	4	6	12
	<b>Total</b>	64	14	28	38	80

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**SUGGESTED EXERCISES/PRACTICALS**

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. required
33	I	Check characteristics of the PN Junction Diodes.	2
34	I	Check characteristics of the Zener Diodes.	2
35	II	Test half wave, Full wave, Bridge rectifier circuits & their regulation characteristics.	6
36	II	Test Capacitor input filter for half wave, Full wave, Bridge rectifier circuits & their regulation characteristics.	4
37	III	Check Voltage multiplier circuits using diode and observe waveforms	2
38	III	Test Clipper & Clamper circuits using diode and observe waveforms	4
39	IV	Plot Input and Output Characteristics of BJT CE configuration. Find Ri and Ro.	2
40	IV	Plot Input and Output Characteristics of BJT CB and CC configuration	4
41	V	Troubleshoot transistor biasing circuits. Find stability factor.	2
42	V	Test transistor single stage AF amplifier (CE configuration). Calculate Bandwidth	2
43	VI	Plot Characteristics of Photo-Transistor.	2
44	VI	Test characteristics of Opto-coupler	2
Total			34

**SUGGESTED STUDENT ACTIVITIES**

Following is the list of proposed student activities like:

1. Prepare journals based on practical performed in laboratory.

2. Collect the information from market regarding specifications and cost of semiconductor devices & submit the report.
3. Find troubleshooting techniques and steps to troubleshoot electronic equipment.

### **SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

- d. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic and magnetic instruments.
- e. Arrange a visit to nearby small scale manufacturing unit and make a report of tools and equipments used.
- f. Arrange educational games like quiz, case studies, role play.

### **SUGGESTED LEARNING RESOURCES**

#### **AA) Books**

<b>Sl. No.</b>	<b>Title of Book</b>	<b>Author</b>	<b>Publication</b>
9	Electronic Devices & Circuits	Allen Mottershead.	Prentice Hall of India New Delhi.,1984
10	Electronic Devices and circuits	David A Bell.	Prentice Hall of India New Delhi.,1986
11	Power Supply (Monographs on Solid State Electronic Instrumentation)	B.S. Sonde.	TataMcGraw Hill,1980
12	Modern Electronic Instrumentation & Measurement Technique	Albert D. Helfrick, William D Cooper.	Prentice Hall of India New Delhi.1985
13	Basic Electronics & Linear Circuit	N.N.Bhargava S.C. Gupta	Tata McGraw Hill,1984

#### **BB) Major Equipment/ Instrument with Broad Specifications**

<b>Sr. No.</b>	<b>Equipment/ Instrument with Broad Specifications</b>
1	Variable DC power supply 0-30V,2A
2	Cathode Ray Oscilloscope Dual Trace 20MHz Or Digital Storage Oscilloscope(DSO): 2 Channel, 500MHz
3	Function Generator 0-1MHz with sine,Square, triangular output with variable amplitude and frequency
4	Digital Multimeter 3 1/2 digit display,9999 counts
5	Bread board 840-1000 contact points
6	Display Trainer boards and kits for experiments
7	Ammeters: (0-200mA, 0-200μA) DC Voltmeter: (0-20V) DC

**CC) Software/Learning/ Simulations Websites**

- i. <http://www.alldatasheet.com/>
- ii. <http://www.datasheets360.com/part/detail/sn7408n/3985257873651237492/?alternatePartManufacturerId=96507>
- iii. <http://nptel.ac.in/courses/117103063/>
- iv. <http://www.nptelvideos.in/2012/11/basic-electronics-prof-tsnatarajan.html>
- v. <http://freevideolectures.com/Course/2261/Basic-Electronics-and-Lab/2>
- vi. <http://www.allaboutcircuits.com/video-lectures/>
- vii. <http://www.electronics-tutorials.com/kits-projects.htm>
- viii. <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv088-Page1.htm>
- ix. <http://www.electronics-tutorials.ws/>
- x. <http://www.learnabout-electronics.org/Amplifiers/amplifiers10.php>
- xi. <http://www.vidyarthiplus.in/2011/11/electronic-device-and-circuits-edc.html>

**Simulations:**

- i. <http://www.indiabix.com/electronics-circuits/diode/>
- ii. <http://www.indiabix.com/electronics-circuits/half-wave-rectifier/>
- iii. <http://www.indiabix.com/electronics-circuits/waveform-clipper/>
- iv. <http://www.indiabix.com/electronics-circuits/voltage-quadrupler/>
- v. <http://www.docircuits.com/lab-manual/9/bjt-characteristics>
- vi. <http://www.falstad.com/circuit/>
- vii. <http://www.indiabix.com/electronics-circuits/common-emitter-amplifier/>
- viii. <https://www.partsim.com/simulator>

**Mapping matrix of PO's, PSO's and CO's:**

Course Outcomes	Program Outcomes							Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
<b>CO1</b>	3	1	1	2	2	1	2	2	2
<b>CO2</b>	2	2	1	2	1	-	1	2	1
<b>CO3</b>	2	2	2	1	2	-	1	2	2
<b>CO4</b>	2	2	2	2	3	1	2	3	3
<b>CO5</b>	2	2	2	2	3	1	2	2	2

**3: High 2: Moderate and 1: Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**

**COURSE : DIGITAL ELECTRONICS COURSE CODE: R18EX3503**  
**COURSE CATEGORY: Core CREDIT : 6**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	2	3	80	20	-	25	50	175

**Rationale:**

Today's digital world highlights the real power of digital electronics. No area of application is untouched by digital electronics. Hence it is essential to know fundamentals of digital electronics. This course gives overall idea and conceptual understanding about Digital Electronics.

**Course Outcomes:**

1. Identify and convert different number systems and codes.
2. Construct simple logic circuits with basic building blocks
3. Understand concepts of sequential logic circuits
4. Identify different logic families
5. Understand signal conversion techniques
6. Construct basic gates using CMOS

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
1.	<b>A) Number Systems.</b>  1.1 Decimal, Binary, Octal, Hexadecimal number systems,  1.2 Conversion from one system to another, signed number representation  using 1's and 2's complement, Binary addition, subtraction using 1's and 2's complement	1.1 Number system and codes :  Classification-Binary, Octal, Decimal,  Hexadecimal number system, Conversion  of one number systems to another, 1's  complement and 2's complement, Binary arithmetic, BCD, Gray, Excess 3, 8-4-2-1 codes	12	16

	<p>1.3 BCD, Gray, Excess 3, 8 -4-2-1 code, Advantages and Disadvantages of these codes.</p> <p><b>B) Logic Gates.</b></p> <p>1.4 AND, OR, NOT, EX -OR, Universal gates – NAND, NOR, symbol, truth table.</p> <p>1.5 Boolean expression, building basic gates using universal gates.</p> <p><b>C) Boolean Algebra.</b></p> <p>1.6 Fundamentals of Boolean algebra, basic laws, commutative, associative, distributive laws, duality principle, De-Morgan's theorems.</p>	<p>1.2 Concept of Logic gates, Basic Logic</p> <p>Gates: NOT AND, OR with symbol, truth tables, logic equations &amp; applications.</p> <p>1.3 Universal Logic Gates: NAND, NOR with symbol, truth table logic equations &amp; applications. NOR as a universal gate, NAND as a universal gate.</p> <p>1.4 Special type of logic gates: EX-OR, EXNOR: with symbol, truth table &amp; applications.</p> <p>1.5 Boolean Algebra: Basic Boolean Laws, Demorgan's Theorem</p>		
2.	<p><b>A) Combinational Logic Circuits.</b></p> <p>2.1 Introduction to logic design, Sum of products (SOP), Product of sum (POS), Don't care conditions</p> <p>2.2 Karnaugh map representation of logic functions, simplification of logical functions using K-map, (2,3 and 4 variables)</p> <p>2.3 Design example – Half adder, Full adder, Half</p>	<p>2.1 Concept of SOP &amp; POS, Standardization</p> <p>2.2 Concept of K map: Definition, Advantages, Representation of 2, 3, 4 variable K-map, K-map reduction technique, don't care condition, Reduction of simple Boolean expression using K-map.</p> <p>2.3 Introduction to</p>	10	12



	<p>subtractor, Full subtractor.</p> <p><b>B) Encoders and Decoders.</b></p> <p>2.4 Multiplexer – concept, 4:1, 8:1, 16:1</p> <p>2.5 Demultiplexer – concept, 1:4, 1:8</p> <p>2.6 Digital circuit design using MUX &amp; DEMUX- one example each.</p> <p>2.7 Decoder – 3:8, 4:16 line decoder</p> <p>2.8 Decimal to BCD Encoder, BCD to 7 segment decoder</p>	<p>combinational logic</p> <p>circuits</p> <p>2.4 (a) Half adder and Half Subtractor,</p> <p>(b) Full adder and Full Subtractor: Block</p> <p>diagram, Truth table and designing using</p> <p>K-map and basic logic gates.</p> <p>2.5 Multiplexers: Necessity of multiplexing,</p> <p>Multiplexer types 4 : 1, 8 : 1, 16 : 1-</p> <p>Block diagram, operating principle, Truth</p> <p>table &amp; Applications, Multiplexer Tree</p> <p>2.6 Demultiplexer: Necessity of Demux.</p> <p>Types of Demux: 1: 4, 1: 8-Block</p> <p>diagram, operating principles Truth table</p> <p>&amp; Applications</p> <p>2.7 Encoder: Definition, Priority Encoders:</p> <p>Decimal to BCD Encoder (IC 74147) –pin</p> <p>diagram, Truth table.</p> <p>2.8 Decoders: Definition, BCD to 7Segment</p> <p>Decoder – Block diagram,</p>		
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		Truth table		
<b>3.</b>	<p><b>A) Sequential Logic Circuits.</b></p> <p>3.1 Concept of Flip-Flop, Flip-Flops: S-R, Clocked RS, T, D, J -K.</p> <p>3.2 Master slave JK, triggering of Flip -Flops, symbols and truth tables, race around condition.</p> <p><b>B) Shift Registers.</b></p> <p>3.3 Concept of register, shift registers – SISO, SIPO, PISO, PIPO, left and right shift</p> <p>3.4 Timing diagrams ring counter.</p> <p><b>C) Counters</b></p> <p>3.5 Concept of counters, synchronous and asynchronous counters</p> <p>3.6 Up/Down counters, timing diagrams, decade and binary counter</p>	<p>3.1 One-bit memory cell, clock signal –</p> <p>Triggering methods: edge triggering and level triggering (Positive and Negative).</p> <p>3.2 Flip Flops - R S flip-flop, Clocked R S flipflop, J-K flip flop, Master slave J-K flip flop, D- flip flop and T-flip flop : using</p> <p>NAND gates - Symbol, Logic diagram, working, truth table</p> <p>3.3 Concept of Preset &amp; Clear, Race around Condition</p> <p>3.4 Shift register: Definition, Types: SISO, SIPO, PISO and PIPO (4-bit)-Block diagram, Working, Truth Table, Timing diagram and Applications.</p> <p>3.5 Ring counter-Circuit, timing diagram</p> <p>3.6 Counters: Basic concept of counter, Classification of Counters: Synchronous and Asynchronous/ripple.</p> <p>3.7 Asynchronous counter (3</p>	<b>10</b>	12

		bit, 4 bit), Mod-N-counter, - Designing, Working, Truth Table, Timing diagram 3.8 Up/Down, decade and binary counters: Designing, Working, Truth Table, Timing diagram		
<b>4.</b>	<b>Logic Families.</b> 4.1 Introduction to logic families, TTL, ECL, CMOS logic families. 4.2 Implementation of logic gates using TTL logic family. 4.3 Implementation of logic gates using ECL logic family . 4.4 Implementation of logic gates using CMOS logic family. 4.5 Characteristics – fan in, fan out, speed, noise immunity, propagation delay, power dissipation. 4.6 Comparison of TTL, ECL, CMOS logic families with reference to above characteristics, tri-state logic. 4.7 Specifications of IC 74XX	4.1 Logic families- Characteristics, Classification - TTL, CMOS, ECL (Comparison only) 4.2 Logic gates implementation in these logic families 4.3 Specifications of IC 74XX	10	12
<b>5.</b>	<b>ADC and DAC.</b> 5.1 A to D and D to A conversion concepts. 5.2 DAC – weighted register type and R-2R ladder type 5.3 Specifications of D/A	5.1 Need of data converters, types of data converter 5.2 DAC: R-2R Ladder - Circuit diagram, Working, Advantages and	10	12

	<p>Converters.</p> <p>5.4 ADC – Ramp, Successive approximation, Flash method</p> <p>5.5 Specifications of A/D Converters.</p>	<p>Disadvantages,</p> <p>DAC specifications (No Mathematical Derivations)</p> <p>5.3 ADC - Successive approximation –Circuit diagram, working, Advantages and Disadvantages</p> <p>5.4Ramp, Flash ADC Circuit diagram, working, Advantages and Disadvantages-</p> <p>5.5 ADC Specifications</p>		
<b>6.</b>	<p><b>CMOS Processing Technology.</b></p> <p>6.1 Basic CMOS technology.</p> <p>6.2 CMOS process enhancement.</p> <p>6.3 BiCMOS Technology.</p> <p>6.4 Static CMOS Design.</p> <p>6.5 Dynamic CMOS Design.</p>	<p>6.1 CMOS Process Enhancement: diagram, description</p> <p>6.2 BiCMOS Technology-diagram, description</p> <p>6.3 Design of logic gates using static and Dynamic CMOS</p>	12	16

**SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)**

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Number Systems.	12	-	4	-	16
	Logic Gates.		2	4	-	
	Boolean Algebra		2	4	-	
2.	Combinational Logic Circuits.	10	-	4	4	12
	Encoders and Decoders		4			
3.	Sequential Logic Circuits.	10	-	4	-	12
	Shift Registers		-	-	4	
	Counters		-	-	4	
4.	Logic Families.	10	8	4	-	12
5.	ADC and DAC.	10	8	4	-	12
6.	CMOS Processing Technology	12	8	4	4	16
	<b>Total</b>	<b>64</b>				<b>80</b>

**Legends:** R = Remember, U = Understanding, A = Application and above levels (Revised Bloom's taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

**SUGGESTED EXERCISES/PRACTICALS**

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1.	1	Verify the truth tables of logic gates. (IC74XX)	4
2.	1	Construction of basic gates using universal gates. (IC7400 and IC7402)	6
3.	2	Construction of half adder and full adder.	6
4.	1	Code conversion using logic gates: Gray to Binary, Binary to Gray (4 bits)	6
5.	2	Design and implement combinational function using MUX IC74151. (3/4 - bit)	4
6.	3	Verification of truth tables of flip-flops using ICs 7474, 7476	6
7.	3	Functional verification of universal shift register using IC 7495. (Shift left and shift right)	6
8.	3	Implement decade counter using IC 7490.	4
9.	3	Implement synchronous counter using IC 74192.	4
10.	3	Implement up-down ripple counter using JK-flip flop. (3-bit)	6
11.	5	Implement ring counter using JK-flip flop. (3-bit)	4
12.	6	Implement R-2R ladder DAC. (3- bit)	8
Total			64

**SUGGESTED STUDENT ACTIVITIES**

1. Seminar presentations on different topics

**SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

- g. Show video/animation film/you tubes to demonstrate the working principles, constructional features of different digital circuits.
- h. Assignments for design practice

## SUGGESTED LEARNING RESOURCES

### DD) Books

SR.NO.	TITLE	AUTHOR	PUBLISHER
1.	Digital Principles	Malvino and Leach	Tata McGraw Hill Pub. New Delhi
2.	Modern digital electronics	R. P. Jain	Tata McGraw Hill Pub. New Delhi
3.	Digital Design	M. Morris Mano	Printice Hall India
4.	Digital Electronics	Gothman	Printice Hall India

### EE) Major Equipment/ Instrument with Broad Specifications

- DC Power Supply (+5V)
- Bread board
- Digital ICs

### FF) Software/Learning/ [Simulations](#) Websites

- [www.alldatasheet.com](http://www.alldatasheet.com)
- [www.electronics-tutorials.com](http://www.electronics-tutorials.com)
- [www.indianscientificinstrument.com](http://www.indianscientificinstrument.com).
- <http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/esc102/node28.html>
- <http://neovlsi.wordpress.com/2009/03/06/what-is-a-universal-gate-and-why-nandis-called-a-universal-gate/>

### Mapping matrix of PO's and CO's:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO1
CO1	1	2	-	-	-	-	2	2	2
CO2	-	2	3	-	-	-	-	2	2
CO3	-	2	3	2	3	-	-	1	2
CO4	-	-	3	-	3	-	2	2	2
CO5	-	2	3	3	2	-		2	3
CO6	-	3	3	2	3	-	2	3	3

### 3: High 2: Moderate and 1:Low Relationship

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE: COMMUNICATION SYSTEM I**      **COURSE CODE: R18 EX3504**

**COURSE CATEGORY : CORE CREDIT : 08**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	4	3	80	20	@50	--	50	200

**Rationale:**

It is the foundation course which will be helpful for understanding higher technologies. It presents information about the basic philosophies, processes, circuits and other building blocks of communication systems.

**Course Outcomes:**

1. Categorize various analog modulation techniques
2. Determine the spectral parameters for various analog modulation schemes.
3. Evaluate transmission line parameters and compare various noise sources.
4. Select appropriate antennas and wave propagation methods for basic communication systems.
5. Compare AM and FM radio receivers.

**Course Details:**

UNIT	NAME OF THE TOPIC (with Details)	LEARNING OUTCOME	HOURS	MARKS
1	<b>Linear Modulation:</b>  1.1 Block diagram of communication system 1.2 Need of modulation 1.3 Concept of modes of Communication(Simplex ,half duplex, full duplex)  1.4 Amplitude modulation-definition, frequency spectrum, mathematical representation  1.5 Modulation index, power and	1a. Elaborate the basic concepts of communication      1b. Determine transmitted power in AM     1c. Classify various types of amplitude modulation techniques.	12	16



	<p>current relations</p> <p>Bandwidth requirements</p> <p><b>1.6 Numerical</b></p> <p><b>1.7 Concept of sidebands(Mathematical representation of DSB and SSB)</b></p> <p><b>1.8 DSB-SC generation( using FET balanced modulator)</b></p> <p><b>1.9 SSB generation using Filter method</b></p> <p><b>1.10SSB-SC generation using Phase shift method</b></p> <p><b>1.11 Block diagram of AM Transmitter</b></p>	1d. Understand generation methods of SSB		
<b>2</b>	<p><b>Angle modulation:</b></p> <p><b>2.1 Frequency Modulation - Definition, mathematical representation</b></p> <p><b>2.2 Modulation index, frequency spectrum of the FM Wave, Bandwidth requirement</b></p> <p><b>2.3 Numerical</b></p> <p><b>2.4 Concept of Phase modulation</b></p> <p><b>2.5 Pre-emphasis and De- emphasis</b></p> <p><b>2.6 Narrowband FM and Wideband FM</b></p> <p><b>2.8 FM Generation methods using Reactance method</b></p> <p><b>2.9 FM Generation methods using Varactor diode method</b></p> <p><b>2.10 FM Generation methods using Armstrong method</b></p>	<p>2a. Evaluate different parameters in frequency modulation technique.</p> <p>2b. Distinguish between various types of frequency modulation</p> <p>2c. Understand the concept of interference.</p> <p>2d. Acquire knowledge of frequency modulation generation method.</p>	<b>10</b>	<b>12</b>
<b>3</b>	<p><b>Transmission lines and Noise:</b></p> <p><b>3.1 Types of Noise(a) External noise-</b></p>	3a.Understand the internal and external	<b>10</b>	<b>12</b>

	<p>atmospheric, Extraterrestrial, Industrial</p> <p>3.2 (b) Internal noise-Thermal agitation, Shot noise</p> <p>Transit time noise ,Miscellaneous noise</p> <p>3.3 Noise parameters-Signal to noise ratio, noise figure, noise resistance</p> <p>3.4 Noise temperature calculations</p> <p>3.5 Numerical</p> <p>3.6 Characteristic impedance, line termination</p> <p>3.7 Standing wave ratio, VSWR</p> <p>3.8 Losses in transmission line</p> <p>3.9 Types of transmission line used</p> <p>3.10 Numerical based on SWR, VSWR</p>	<p>sources of noise</p> <p>3b. Evaluate various noise parameters</p> <p>3c. Determine various transmission line parameters.</p> <p>3d. Understand various losses present in transmission lines.</p>		
<b>4</b>	<p><b>Antenna and wave propagation:</b></p> <p><b>4.1</b> Electromagnetic spectrum</p> <p><b>4.2</b> Concept of dipole antenna, resonant antenna, non resonant antenna</p> <p><b>4.3</b> Antenna parameters-Gain, antenna resistance, Bandwidth, Beamwidth , Directivity, Radiation pattern, Polarization, isotropic antenna</p> <p><b>4.4</b> Structure, radiation pattern and application of Yagi –Uda, Horn antenna</p> <p><b>4.5</b> Structure, radiation pattern and application of Loop antenna, Dish antenna</p> <p><b>4.6</b> Ground wave propagation, radio horizon, optical Horizon</p> <p><b>4.7</b> Ionosphere details</p>	<p>4a. Understand various types of antenna and their applications</p> <p>4b. Evaluate different antenna parameters.</p> <p>4c. Learn the basics of wave propagation methods.</p>	<b>12</b>	<b>16</b>

	<b>4.8</b> Sky wave propagation <b>4.9</b> Space wave propagation <b>4.10</b> Virtual height, actual height, critical frequency, critical angle, skip zone, MUF, skip distance <b>4.11</b> LOS communication			
<b>5</b>	<b>Radio Receiver:</b> <b>5.1</b> AM superheterodyne Receiver-block diagram and Working with waveforms <b>5.2</b> Sensitivity, selectivity, fidelity <b>5.3</b> Image Frequency and its rejection, double spotting <b>5.4</b> Frequency changing and tracking <b>5.5</b> Diode detector-Simple and practical <b>5.6</b> Need of AGC simple and delayed <b>5.7</b> FM superheterodyne Receiver-block diagram and working with waveforms <b>5.8</b> Limiter- circuit diagram and working <b>5.9</b> FM detector types-Balanced slope detector <b>5.10</b> Phase discriminators	5a. Elaborate AM and FM superheterodyne receiver.  5b. Acquire the knowledge of issues related to radio receiver.  5c. Perform test of characteristics for radio receivers	<b>10</b>	<b>12</b>
<b>6</b>	<b>Pulse analog modulation:</b> <b>6.1</b> Need of pulse modulation <b>6.2</b> Band limited & time limited signals <b>6.3</b> Sampling theorem Nyquist criteria <b>6.4</b> Sampling methods- Natural, Flat top	6a. Determine sampling frequency based on nyquist criteria.  6b. Distinguish between various pulse modulation schemes.	<b>10</b>	<b>12</b>

	<b>6.5</b> Aperture and aliasing effect  <b>6.6</b> PAM,PWM &PPM Modulation- block diagram, working and waveforms  <b>6.7</b> Advantages,disadvantages and their comparison  <b>6.8</b> Generation of PPM and PWM using IC 555  <b>6.9</b> Numerical based on sampling theorem	6c. Learn the generation methods of analog pulse modulation techniques		
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### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

UNIT NO	UNIT TITLE	DISTRIBUTION OF THEORY MARKS			
		R LEVEL	U LEVEL	A LEVEL	TOTAL MARKS
1	Linear modulation	4	8	4	16
2	Angle modulation	2	8	2	12
3	Transmission lines and Noise	4	4	4	12
4	Antenna and wave propagation	4	10	2	16
5	Radio receiver	8	4	--	12
6	Pulse analog modulation	4	6	2	12
	<b>TOTAL</b>	<b>26</b>	<b>40</b>	<b>14</b>	<b>80</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS (Any 20)

Sr. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx. Hrs. Required
1	1	AM, Generation, waveform observation & measurements	02
2	1	Measurement of modulation index of AM	02
3	2	FM Generation, waveform observation & measurements	02

4	2	Measurement of modulation index of FM	02
5	1&2	Observation of AM signals and FM spectrum	02
6	1	SSB generation, waveform observation & measurement	02
7	1	DSB generation, waveform observation & measurement	02
8	2	Plot the pre emphasis curves for FM	02
9	2	Plot the de emphasis curves for FM	02
10	3	Measurement of characteristic impedance of transmission line	02
11	3	Measurement of VSWR of transmission line	02
12	3	Measurement of attenuation of transmission line	02
13	4	Plotting of polar diagram of antenna ( $L=3/2\lambda$ dipole antenna)	02
14	4	Plotting of polar diagram of antenna (Folded Dipole)	02
15	4	Plotting of polar diagram of antenna (Yagi-Uda antenna)	02
16	4	Plotting of polar diagram of antenna (HURTZ antenna)	02
17	5	Plotting sensitivity curve of radio receiver	02
18	5	Plotting selectivity curve of radio receiver	02
19	5	Plotting fidelity curve of radio receiver	02
20	6	Study of sampling techniques: Natural Sampling, Flat top Sampling	02
21	6	Study of PWM modulation and demodulation	02
22	6	Study of PPM modulation and demodulation	02
23	6	Generation of PPM using IC 555	02
24	6	Generation of PWM using IC 555	02
<b>TOTAL</b>			<b>40</b>

### **SUGGESTED STUDENT ACTIVITIES**

1. Download different application based on electromagnetic spectrum.
2. Collect data about AM and FM frequencies from radio stations.
3. Collect the frequencies of different TV channels.
4. Collect the data about types of modulations used in different communication applications.

### **SPECIAL INSTRUCTIONAL STRATEGIES**

1. Show video to demonstrate the working principles, constructional features, testing and understandings of different types of modulations
2. Arrange a visit to any radio station.
3. Arrange expert lecture of an industry person in the area of communication.

### **SUGGESTED LEARNING RESOURCES**

#### **GG) Books**

NO	TITLE	AUTHOR	PUBLICATION
1	Electronic Communication System	Kenedy, Devis	McGraw Hill
2	Electronic Communication System	Roddy Coolen	PHI
3	Principle of Communication System	Taub shelling	McGraw Hill
4	Principals of electronic communication system	Louis. E.Frenzel	McGraw Hill

#### **HH) Major Equipment/ Instrument with Broad Specifications**

1. Digital Storage oscilloscope (100MHz, 2GS/sec)
2. Trainer kits of analog communication experiments
3. Function generator (1MHz, 30Vp-p)

#### **II) Software/Learning/ Simulations Websites**

- 1) [www.nptel.com](http://www.nptel.com)
- 2) [www.electronics-tutorials.com](http://www.electronics-tutorials.com)

### Mapping matrix of POs, PSOs and COs

Course Outcomes	Programme Outcomes							PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO-1	3	2	1	3	-	3	1	3	2
CO-2	3	3	3	3	1	3	2	3	3
CO-3	2	2	2	3	1	3	2	3	2
CO-4	3	2	2	3	1	3	2	2	2
CO-5	3	3	2	3	-	3	2	3	3

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**

**COURSE: LINEAR INTEGRATED CIRCUITS**      **COURSE CODE: R18EX3505**

**COURSE CATEGORY : CORE**      **CREDIT : 6**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	2	3	80	20	-	@25	50	175

**@ Internal Assessment**

**Rationale:**

The operational Amplifier was one of the first analogue integrated circuits, because of its usefulness as a building block in many circuit designs. This course includes the important practical guidelines about the design of linear and non-linear op-amp circuits. Today the growth of any industry depends upon electronics to great extent. Contents of this subject are the basic building blocks of different analog circuits. Prerequisites various devices and circuits studied in Electronic Lab Practices and Semiconductor Devices and Circuits..

**Course Outcomes:**

1. Calculate different parameters of OPAMP IC
2. Analyze the OPAMP configurations and circuits.
3. Troubleshoot the problems in OPAMP Application circuits.
4. Maintain the Filter used in various electronics circuits.
5. Test the Multivibrators and Oscillators using electronic instruments

**Course Details:**

NAME OF THE REVISED TOPIC	Major Learning Outcomes	HOURS	MARKS
<b>Differential Amplifier:</b> 1.1 Differential Amplifier, Circuit Diagram, working, calculation for gain, CMRR. 1.2 OP-AMP: Concept, fabrication, basic building block of typical -741. 1.3 Parameters of Op-Amp: Input offset voltage, Input offset current, Input bias current, differential input resistance, Input capacitance, Input voltage range, offset voltage adjustment range, Common Mode Rejection Ratio (CMRR), Supply Voltage Rejection Ratio(SVRR), large signal voltage gain and transfer characteristics supply voltages, supply current, output voltage swing, output resistance, slew rate, gain bandwidth product 1.4 Typical parameter comparisons 741, 351.	1a. Explain working principal of Differential Amplifier. 1b. Solve problems based on OPAMP parameters 1c. Compare the specifications of IC741 and IC351	08	12
<b>Op-Amp Configuration:</b> 2.1 Open loop and closed loop configuration	2a. Distinguish the terms: Virtual ground, virtual short 2b. Solve problems based on	12	12



<p>of Op-Amp, its comparison. Virtual ground, virtual short concept.</p> <p>Open loop configuration – Inverting , Non-inverting, Close loop configuration – Inverting, non- inverting,</p> <p>Differential amplifier, unity gain amplifier (voltage follower)</p> <p>2.2 Inverting and non-inverting configuration of Adders (summing amplifier, scaling Amplifier, averaging amplifier) Subtractor.</p> <p>Basic Integrator &amp; Basic Differentiator- Circuit diagram, Working, Waveforms &amp; Practical circuits.</p> <p>Basic concept of frequency compensation of Op-Amp and Offset nulling.</p> <p>Numerical based on designing of above circuit.</p>	<p>OPAMP configurations and applications</p> <p>2c. Explain working principal of different types of amplifiers using OPAMP.</p>		
<p><b>Applications of Op-Amp:</b></p> <p>3.1 Instrumentation Amplifier : Circuit diagram, operation, derivation of output voltage Equation. Advantages and applications of Instrumentation amplifier. Pin diagram pin functions and specifications of IC LM 324</p> <p>Voltage to current converter (with floating load, with grounded load) Current to voltage converter.</p> <p>Precision Rectifier- Half wave and Full wave.</p> <p>3.2 Sample and hold circuit.</p> <p>Logarithmic and antilogarithmic amplifiers (using Diodes)</p> <p>Comparator: Circuit diagrams and operation of</p> <ul style="list-style-type: none"> <li>• Zero crossing detector,</li> <li>• Schmitt trigger,</li> <li>• Window detector,</li> <li>• Peak to peak detector</li> </ul> <p>3.3 IC 339- Quad Voltage Comparator</p> <p>IC710 Voltage Comparator</p>	<p>3f. Sketch and Explain the working principal of Instrumentation Amplifier V to I and I to V converter Logarithmic and antilogarithmic amplifiers Comparators.</p> <p>3g. Compare half wave and Full wave precision rectifier.</p> <p>3h. Differentiate Comparator and Schmitt trigger</p> <p>3i. Explain the procedure to troubleshoot comparator</p>	12	16
<p><b>Multivibrators:</b></p> <p>4.1 IC 555 internal block diagram, Pin Diagram.</p> <p>4.2 IC 555 operation as Monostable multivibrator circuit diagram, operation and waveforms generation</p> <p>4.3 IC 555 operation as Astable multivibrator circuit diagram, operation and waveforms generation</p>	<p>4a. Sketch and write short note on Block diagram of IC555.</p> <p>4b. Explain the working of Monostable multivibrator, Astable multivibrator</p> <p>4c. Solve the numerical based on Multivibrator</p> <p>4d. Compare types of multivibrator</p> <p>4e. Explain working of PLL with</p>	10	12

4.4 Expression for Time Period, limitations, specifications 4.5 Numerical on astable and monostable multivibrator. 4.6 Phase lock loop (PLL): block diagram and operation, capture and lock range. 4.7 Application of PLL as Multiplier and FM Demodulator	block diagram 4f. Calculate capture and lock range of given PLL 4g. Explain the procedure to troubleshoot Multiplier and FM Demodulator.		
<b>Filters:</b> 5.1 Introduction to filters ,Classification of filters, 5.2 Concept of passive and active filters 5.3 Merits and demerits of active filters over passive filters 5.4 Ideal and actual characteristics, terms: - cut off frequency, Pass band, Stop band, center frequency, roll off rate, BW, Q-factor, first order and second order Butterworth filters, order of filter, Low pass filter, high pass filter, band pass filter ( wide band pass , narrow band pass filter) Band reject filter(wide band reject, narrow band reject filter), all pass filter. Numerical based on design of different filters.	5a. Distinguish the terms: passive and active filters 5b. Explain the working of all types of Filters. 5c. Design different filters using suitable formula 5d. Explain the procedure to troubleshoot Filter.	14	16
<b>Oscillators:</b> 6.1 Concept of oscillators, 6.2 Types of oscillators: Phase shift oscillators, Wien bridge oscillators using IC-741 6.3 Types of Multivibrators: Monostable, Astable, Bistable using IC-741. Schmitt trigger, voltage controlled oscillator (VCO) using IC-555.	6a. Define Barkhausen Criteria 6b. Explain the working of all types of Oscillators and Multivibrators using IC741. 6c. Differentiate types of Oscillators and Multivibrators using IC741. 6d. Explain the procedure to troubleshoot Oscillator.	08	12
Total		64	80

**SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)**

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Differential Amplifier	08	4	4	4	12
II	Op-Amp Configuration	12	2	4	6	12
III	Applications of Op-Amp	12	2	6	8	16
IV	Multivibrators	10	2	4	6	12
V	Filters	14	4	4	8	16
VI	Oscillators	08	2	4	6	12
	Total	64	16	26	38	80

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**SUGGESTED EXERCISES/PRACTICALS**

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. required
45	I	To Measure Op-amp Parameter- Bias current, Input offset V & I, Open loop gain, Slew rate. To Measure Op-amp Parameter- CMRR, input, output impedance and frequency response of IC 741.	2
46	II	To test INV, NON INV, Summing & Subtraction Amplifier using IC 741.	6
47	II	To troubleshoot Integrator & Differentiator Circuits using IC 741.	4
48	III	To test Instrumentation Amplifier using IC 741.	2
49	III	To troubleshoot precision Rectifier using IC 741.	2
50	III	To troubleshoot Comparators- Zero crossing Detector and Peak-Peak Detectors.	4
51	III	To troubleshoot Schmitt Trigger using IC 555 and plot output waveform and find out UTP and LTP.	4
52	IV	To test Astable Multivibrator using IC 555.	2
53	IV	To test Monostable Multivibrator using IC 555.	2
54	V	To test Wein bridge Oscillator using 741.	2
55	VI	To troubleshoot RC phase shift Oscillator using 741.	2
56	VI	To plot the frequency response of High Pass & Low Pass Filter Circuits using IC 741.	2
<b>Total</b>			<b>34</b>

## SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- i. Prepare journals based on practical performed in laboratory.
- ii. Collect the information from market regarding specifications and cost of analog integrated circuits & submit the report.
- iii. Find troubleshooting techniques and steps to troubleshoot electronic equipment.

## SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- i. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic and magnetic instruments.
- j. Arrange a visit to nearby small scale manufacturing unit and make a report of tools and equipments used.
- k. Arrange educational games like quiz, case studies.

## SUGGESTED LEARNING RESOURCES

### JJ) Books

Sr. No.	Title of Book	Author	Publication
1	Op-amp & Linear Integrated Circuits	Ramakant Gaikwad	Prentice Hall India, New Delhi, Edition 4, 2000
2	Integrated Circuits	K.R. Botkar	Khanna, Edition: 5, Year: 2010
3	Operational Amplifiers and Linear ICs	David A. Bell	Oxford University Press, New Delhi, 2011
4	Operational Amplifiers with Linear Integrated Circuits	William D. Stanley	Pearson Education India, New Delhi, 2004
5	Linear Integrated Circuits	S. Salivahanan	McGraw Hill, New Delhi, 2008

### KK) Major Equipment/ Instrument with Broad Specifications

Sr.No.	Equipment/ Instrument with Broad Specifications
1	Variable DC power supply 0-30V, 2A
2	Cathode Ray Oscilloscope Dual Trace 20MHz Or Digital Storage Oscilloscope(DSO): 2 Channel, 500MHz
3	Function Generator 0-1MHz with sine, Square, triangular output with variable amplitude and frequency
4	Digital Multimeter 3 1/2 digit display, 9999 counts
5	Bread board 840-1000 contact points
6	Display Trainer boards and kits for experiments
7	Ammeters: (0-200mA, 0-200μA) DC Voltmeter: (0-20V) DC

**LL) Software/Learning/ Simulations Websites**

- xii. <http://www.alldatasheet.com/>
- xiii. <http://www.datasheets360.com/part/detail/sn7408n/3985257873651237492/?alternatePartManufacturerId=96507>
- xiv. <http://nptel.ac.in/courses/117103063/>
- xv. <http://www.nptelvideos.in/2012/11/basic-electronics-prof-tsnatarajan.html>
- xvi. <http://freevideolectures.com/Course/2261/Basic-Electronics-and-Lab/2>
- xvii. <http://www.allaboutcircuits.com/video-lectures/>
- xviii. <http://www.electronics-tutorials.com/kits-projects.htm>
- xix. <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv088-Page1.htm>
- xx. <http://www.electronics-tutorials.ws/>
- xxi. <http://www.learnabout-electronics.org/Amplifiers/amplifiers10.php>
- xxii. <http://www.vidyarthiplus.in/2011/11/electronic-device-and-circuits-edc.html>

**Simulations:**

- ix. <http://www.indiabix.com/electronics-circuits/diode/>
- x. <http://www.indiabix.com/electronics-circuits/half-wave-rectifier/>
- xi. <http://www.indiabix.com/electronics-circuits/waveform-clipper/>
- xii. <http://www.indiabix.com/electronics-circuits/voltage-quadrupler/>
- xiii. <http://www.docircuits.com/lab-manual/9/bjt-characteristics>
- xiv. <http://www.falstad.com/circuit/>
- xv. <http://www.indiabix.com/electronics-circuits/common-emitter-amplifier/>
- xvi. <https://www.partsim.com/simulator>

**Mapping matrix of PO's, PSO's and CO's:**

Course Outcomes	Program Outcomes							Program Specific Outcomes	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	1	2	2	2	-	1	2	2
CO2	2	2	2	2	2	1	2	2	1
CO3	2	2	2	3	2	1	1	3	3
CO4	2	2	2	2	2	-	1	2	2
CO5	2	2	2	3	3	1	2	3	3

**3: High 2: Moderate and 1: Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : COMMUNICATION SYSTEM-II COURSE CODE: R18EX3506**  
**COURSE CATEGORY : CORE CREDIT : 06**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	2	3	80	20	50	--	50	200

**Rationale:**

Modern telecommunication systems have growing demands of increasing data rate. This subject enables students to comprehend different digital modulation schemes which have different data rates and bandwidths. This subject gives basic idea about finite set of discrete messages, the key processing steps at the transmitter, channel, receiver and ultimately the information sink.

This subject familiarize students with formatting and source coding, band pass signaling, equalization, channel coding, multiplexing and multiple access, spreading and synchronization

**Course Outcomes:**

1. Compare various digital Modulation techniques.
2. Estimate Channel capacity and information rate of Digital Communication System.
3. Apply encoding technique for given digital data stream.
4. Select Multiplexing and Multiple Access technique for telecommunication system.
5. Generate Pseudo Noise code and elaborate Spread spectrum.

**Course Details:**

UNIT	NAME OF THE TOPIC (with Details)	LEARNING OUTCOME	HOURS	MAR KS
1	<b>DIGITAL PULSE MODULATION TECHNIQUES</b>  1.1 PCM- block diagram and working Quantization linear and nonlinear  1.2 Companding  1.2 ISI, eye pattern 1.3 Numerical based on nyquist rate & PCM 1.6 DM-transmitter and receiver block	1a. Evaluate signaling rate for pulse code modulation system.  1b. Understand issues related to digital communication system  1c. Distinguish between delta modulation and adaptive delta modulation, pulse code modulation and differential pulse code modulation systems.	12	16

	<p>diagram and working</p> <p><b>1.7</b> Slope overload and granular noise</p> <p><b>1.8</b> ADM- transmitter and receiver block diagram and working</p> <p><b>1.9</b> DPCM- transmitter and receiver block diagram and working,</p> <p><b>1.10</b> Vocoder</p>	1d. Understand the concept of vocoders.		
<b>2</b>	<p><b>PROBABILITY AND INFORMATION THEORY</b></p> <p><b>2.1</b> Introduction to probability.</p> <p><b>2.2</b> Definitions- outcome, random expt , random events, sample space, mutually exclusive events, intersection of events, occurrence</p> <p><b>2.3</b> Probability of random events</p> <p><b>2.4</b> Joint probabilities.</p> <p><b>2.5</b> Conditional probability.</p> <p><b>2.6</b> Concept of bit rate, baud rate, information, Message.</p> <p><b>2.7</b> Average information(Entropy), information rate with numerical</p> <p><b>2.8</b> Shannon's theorem for channel capacity with numerical</p>	<p>2a. Understand the basic concepts of probability theory.</p> <p>2b. Explain concepts related to information theory.</p> <p>2c. Evaluate digital communication rate parameters based on Shannon's channel capacity theorem.</p>	<b>10</b>	<b>12</b>
<b>3</b>	<p><b>CODING TECHNIQUES</b></p> <p><b>3.1</b> Line coding-unipolar, bipolar RZ, NRZ,</p> <p><b>3.2</b> Split phase Manchester, AMI-waveform representation &amp; concept</p> <p><b>3.3</b> Source coding- ASCII,EBCDIC</p> <p><b>3.4</b> Huffman coding</p> <p><b>3.5</b> Channel coding- concept of error causes of error, their effects</p> <p><b>3.6</b> Error detection and correction using</p>	<p>3a. Encode various digital data bit streams into different line code formats.</p> <p>3b. Carry out Huffman code for given set of probabilities.</p> <p>3c. Understand concept of error detection and error correction using parity bits.</p>	<b>10</b>	<b>12</b>

	<p>parity with numerical</p> <p><b>3.7</b> Error control codes, check sum, VRC, LRC, CRC</p> <p><b>3.8</b> Hamming code and Hamming Distance</p>			
<b>4</b>	<p><b>DIGITAL CW MODULATION TECHNIQUES</b></p> <p><b>4.1</b> Transmitter, receiver block diagram, working with waveform, bandwidth and constellation diagram of following</p> <p><b>4.1.1</b> ASK</p> <p><b>4.1.2</b> FSK</p> <p><b>4.1.3</b> PSK</p> <p><b>4.1.4</b> DPSK</p> <p><b>4.1.5</b> QPSK</p> <p><b>4.1.6</b> 8-QAM</p> <p><b>4.1.7</b> M-ary communication system</p> <p style="padding-left: 40px;"><b>4.1.7.1</b> M-ary PSK</p> <p style="padding-left: 40px;"><b>4.1.7.2</b> M-ary FSK</p> <p><b>4.2</b> Comparison of all shift keying techniques</p>	<p>4a. Carry out the mathematical analysis for various digital continuous wave modulation techniques for understanding the systems.</p> <p>4b. Distinguish various shift keying techniques.</p>	<b>12</b>	<b>16</b>
<b>5</b>	<p><b>MULTIPLEXING AND MULTIPLE ACCESS</b></p> <p><b>5.1</b> Need of multiplexing</p> <p><b>5.2</b> Concept of multiplexing</p> <p><b>5.3</b> TDM,FDM</p> <p><b>5.4</b> CDM, SDM</p> <p><b>5.5</b> Duplexing in time and frequency domain</p> <p><b>5.6</b> TDMA,FDMA</p> <p><b>5.7</b> CDMA,SDMA</p>	<p>5a. Understand the concept of multiplexing and multiple access methods.</p> <p>5b. Elaborate various types of applications for multiplexing and multiple access methods.</p>	<b>10</b>	<b>12</b>



<b>6</b>	<b>SPREAD SPECTRUM TECHNIQUES</b> <b>6.1</b> Concept of spreading the spectrum <b>6.2</b> Advantages of spread spectrum <b>6.3</b> Properties of PN sequence <b>6.4</b> FH-SS- transmitter and Receiver block diagram & working <b>6.5</b> Slow FHSS and fast FHSS <b>6.6</b> Direct Sequence spread Spectrum-transmitter and Receiver block diagram & working <b>6.7</b> Comparison of DS-SS and FH-SS <b>6.8</b> Application of FHSS	6a. Perform generation of pseudo noise code.  6b. Illustrate properties of PN sequence.  6c. Distinguish between spread spectrum techniques.  6d. Prepare a report on application of spread spectrum technology.	<b>10</b>	<b>12</b>
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#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

UNIT NO	UNIT TITLE	DISTRIBUTION OF THEORY MARKS			
		R LEVEL	U LEVEL	A LEVEL	TOTAL MARKS
1	Digital pulse modulation techniques	4	10	2	16
2	Probability and information theory	4	6	2	12
3	Coding techniques	4	4	4	12
4	Digital CW modulation techniques	6	6	4	16
5	Multiplexing and multiple access	2	8	2	12
6	Spread spectrum techniques	2	8	2	12
	<b>Total</b>	<b>22</b>	<b>42</b>	<b>16</b>	<b>80</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**SUGGESTED EXERCISES/PRACTICALS (any 10)**

<b>SR. NO.</b>	<b>UNIT NO.</b>	<b>PRACTICAL EXERCISES (OUTCOMES IN PSYCHOMOTOR DOMAIN)</b>	<b>APPROX. HRS. REQUIRED</b>
1	1	Pulse code modulation and demodulation	<b>02</b>
2	1	Delta modulation and demodulation	<b>02</b>
3	1	Adaptive Delta modulation and demodulation	<b>02</b>
4	2	Evaluate the channel capacity for given parameters( using MATLAB/SCILAB software)	<b>02</b>
5	3	Data encoding and decoding techniques	<b>02</b>
6	4	Carrier modulation and demodulation techniques (ASK/FSK)	<b>02</b>
7	4	BPSK modulation and demodulation techniques	<b>02</b>
8	4	QPSK modulation and demodulation	<b>02</b>
9	5	TDM using direct synchronization technique	<b>02</b>
10	6	Verification of spreading code generation using DS-SS coherent PSK	<b>02</b>
11	6	Observation of waveforms of slow FH-SS	<b>02</b>
12	6	Generate 3 or 4 bit PN sequence	<b>02</b>
<b>TOTAL</b>			<b>20</b>

**SUGGESTED STUDENT ACTIVITIES**

1. Design sample and hold Circuit
2. Collect technical specifications of Bluetooth headphone.
3. Generate (7, 4) Hamming code using SCILAB.
4. Search of applications of various continuous modulation and spread spectrum techniques in different advanced communication techniques and Write a report on it.

**SPECIAL INSTRUCTIONAL STRATEGIES**

1. Animation/video films showing the Principle of working, Waveforms and features of PCM/DM/ADM/DPCM and Digital Modulation Techniques should be shown to students while teaching the concerned topic.
2. Demonstrate how to transfer data through Modem, USB and Bluetooth using Mobile, Computers.
3. Industrial Visit to telephone exchange.

## SUGGESTED LEARNING RESOURCES

### MM)Books

SR.NO.	TITLE	AUTHOR	PUBLICATION
1	Electronic Communication System	Kenedy, Devis	McGraw Hill
2	Electronic Communication System	Roddy Coolen	PHI
3	Principle of Communication System	Taub shelling	McGraw Hill
4	Digital and Analog communication system	K.Sam Shanmugam	Willey publication
5	Principals of electronic communication system	Louis. E.Frenzel	McGraw Hill
6	Wireless communications principles and practice	Thodore S. Rappaport	Pearson

### NN) Major Equipment/ Instrument with Broad Specifications

1. Digital Communication trainer kits
2. Digital storage oscilloscope (2/4 channel, 100 MHz, 2GS/sec)

### OO) Software/Learning/ Simulations Websites

1. <http://goavendano.tripod.com/pulsemod.pdf>
2. [http://www.eecs.yorku.ca/course\\_archive/2010-11/F/3213/CSE3213\\_09\\_PCM\\_F2010.pdf](http://www.eecs.yorku.ca/course_archive/2010-11/F/3213/CSE3213_09_PCM_F2010.pdf)
3. <http://www.utdallas.edu/~torlak/courses/ee4367/lectures/CodingI.pdf>
4. <http://ee.eng.usm.my/eeacad/mandeep/EEE436/CHAPTER2.pdf>
5. [http://course.ee.ust.hk/elec214/12spg-Song/notes/Elec3100\\_2012\\_Ch11\\_Multiplexing\\_Final.pdf](http://course.ee.ust.hk/elec214/12spg-Song/notes/Elec3100_2012_Ch11_Multiplexing_Final.pdf)
6. [http://www.cs.ucy.ac.cy/courses/EPL657/Fundamental\\_Concepts.pdf](http://www.cs.ucy.ac.cy/courses/EPL657/Fundamental_Concepts.pdf)
7. <http://elearning.vtu.ac.in/P6/enotes/EC6/Unit7-SU.pdf>
8. <http://fetweb.ju.edu.jo/staff/EE/jrahhal/PDF/SpreadSpectrum3.pdf>
9. MATLAB software/ Electronics work bench software/ SCILAB for the simulation

### Mapping matrix of POs, PSOs and COs

Course Outcomes	Programme Outcomes							PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO-1	2	2	3	3	1	3	2	3	2
CO-2	3	2	1	2	-	2	2	1	1
CO-3	2	2	2	2	1	2	3	2	1
CO-4	2	2	2	2	1	2	3	2	1
CO-5	2	2	3	2	1	2	3	2	2

**3: High 2: Moderate and 1:Low Relationship**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING****COURSE : ELECTRONIC MEASUREMENT COURSE CODE: R18EX3507****COURSE CATEGORY: CORE CREDIT : 6****Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	2	3	80	20	25	--	50	175

**Rationale:**

While working as a technician in electronics the student must understand how to select, measure and use proper measuring instruments. This subject presumes that the students are familiar with basic utilization of measuring instruments. The era of this subject consists of the information about concepts, principles and procedures of analog and digital electronic measuring instruments and measuring techniques.

It is also necessary to know the basic principles of transducers and show how they can be exploited for the measurement of large number of variables. With the background of measuring instruments, this subject deals with measurement of different physical parameters like temperature, pressure etc.

**Course Outcomes:**

1. Understand the basic facts and concepts of measurement.
2. Select the appropriate instruments for measurement.
3. Categorize different transducers and their selection criterion.
4. Use different transducers for temperature measurement.
5. Understand different pressure measuring transducers.
6. Identify different special transducers.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
1	<b>Measurement Concepts:</b> 1.1 Static characteristics of Instruments: Accuracy, Precision, Sensitivity, Linearity, Resolution, Static error, Reproducibility, Drift, Dead Zone. 1.2 Dynamic characteristics of Instruments: Speed of response, Lag, fidelity, Dynamic error. 1.3 Units and standards of measurements. 1.4 Classification of standards:- International, Primary, Secondary, Working. 1.5 Types of Errors:- Gross, Systemic, Random.	1. Explain Static and dynamic characteristics of instruments.  2. Explain measurement standards.  3. State types of errors in measuring instruments.	12	16

	1.6 PMMC instruments:- Construction, working principle, applications. 1.7 True RMS meters:- Construction, working principle, applications. 1.8 Auto- ranging DMM:- Construction, working principle, applications.			
<b>2</b>	<b>Measuring Instruments:</b> 2.1 Cathode ray oscilloscopes - block schematic and applications. 2.2 Digital Storage Oscilloscope- block schematic and applications. 2.3 Function generators - block schematic and applications. 2.4 RF signal generators - block schematic and applications. 2.5 Frequency counters - measurement of frequency and time Interval. 2.6 Universal counter - block schematic and applications. 2.7 LCR meter - block schematic and applications.	1. Select the measuring Instrument. 2. Calibrate the measuring instrument.	<b>10</b>	<b>12</b>
<b>3</b>	<b>Transducers Basic:</b> 3.1 Introduction - Electrical and Mechanical transducers. 3.2 Characteristics of electrical transducers. 3.3 Classification of Electrical Transducer: Primary and Secondary, Active and Passive, analog and digital transducers 3.4 Transducer Selection Criterion. 3.5 Transduction Principle: Capacitive, Inductive, Electromagnetic and Piezoelectric transduction.	1. Classify various electrical transducers. 2. Enlist transducer selection criterion.	<b>10</b>	<b>12</b>
<b>4</b>	<b>Temperature measurement:</b> 4.1 Introduction - Definition and units. 4.2 Different temperature scales & their conversions. 4.3 Classification of temperature measuring transducers. 4.4 Thermistors – PTC and NTC. 4.5 Resistance Thermometer – RTD (PT-100): 2 /3/4 Wire systems. 4.6 Thermocouple – Seeback & Peltier effect , Types J, K, R , S, T etc. 4.7 Pyrometer - Optical, Radiation. <b>Note:</b> Each transducer should be studied on the basis of working principle, construction, material used, measurement range, advantages, disadvantages and applications.	1. Understand temperature scales. 2. Elaborate temperature transducers. 3. Select transducer for temperature measurement.	<b>12</b>	<b>16</b>
<b>5</b>	<b>Pressure measurement:</b> 5.1 Introduction - Definition and units: Absolute, Gauge, Atmospheric, Vacuum.	1. Compare various pressure measuring devices.	<b>10</b>	<b>12</b>

	5.2 Classification of Pressure measuring devices. 5.3 Non elastic pressure transducer: U tube, Inclined Tube, Well type Manometer. 5.4 Elastic pressure transducer: Bourdon Tube, Bellows, Diaphragm, Capsule. 5.5 Electronic pressure transducers: Bourdon tube with LVDT. 5.6 Diaphragm with Strain gauge. 5.7 Calibration of pressure gauge using dead weight tester. <b>Note:</b> Each transducer should be studied on the basis of working principle, construction, material used, measurement range, advantages, disadvantages and applications.	2. Explain pressure transducers.  3. Select transducer for pressure measurement.		
<b>6</b>	<b>Special Transducers and Measurements:</b> 6.1 Light intensity Transducers:- working principle, construction, advantages, disadvantages and applications. 6.2 Piezoelectric Transducers:- working principle, construction, advantages, disadvantages and applications. 6.3 Ultrasonic Transducers:- working principle, construction, advantages, disadvantages and applications. 6.4 Humidity measurement:- Psychrometer and Hygrometer. 6.5 Speed measurement:- Photoelectric and Magnetic pick-up. 6.6 pH Measurement concept.	1. Illustrate piezoelectric and ultrasonic transducers.  2. Select transducer for light intensity, humidity and speed measurement.	<b>10</b>	<b>12</b>

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Measurement Concepts	12	6	6	4	16
2	Measuring Instruments	10	4	4	4	12
3	Transducers Basic	10	5	4	3	12
4	Temperature measurement	12	6	6	4	16
5	Pressure measurement	10	4	4	4	12
6	Special Transducers and Measurements	10	3	6	3	12
	Total	64	28	30	22	80

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

## SUGGESTED EXERCISES/PRACTICALS

Sr. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	1	Determination of random error by using Statistical analysis.	2
2	1	Measurement of Resistance, Voltage, Current using DMM and Auto Range DMM.	2
3	2	Perform the experiment on Dual Trace CRO controls & component test using CRO.	2
4	2	Perform the experiment on DSO & Measurements by storing a wave form.	2
5	2	Perform the experiment on Freq. Counter & measurement of frequency and period.	2
6	2	Perform the experiment on LCR-Q meter and measurement of L, C, R & Q.	2
7	4	Perform the experiment on temperature measurement using RTD. (Pt-100)	2
8	4	Perform the experiment on temperature measurement using Thermocouple (using R, J, K etc.)	2
9	5	Perform the experiment on pressure measurement using Bourdon tube with LVDT.	2
10	5	Calibration of Pressure gauge using Dead Weight Pressure gauge Tester.	2
Total			20×3=60

## SUGGESTED STUDENT ACTIVITIES

5. Collect specifications of various measuring instruments and transducers using internet.
6. Attend the expert lecture and make report on that.
7. Do the assignments on measurement transducers from curriculum.
8. From the electronics magazines find out different latest measuring transducers for physical parameters.

## SPECIAL INSTRUCTIONAL STRATEGIES

1. Prepare power point presentations on CRO, analog meters, digital meters and various transducers.
2. Arrange a visit to related to instrumentation control industry.
3. Arrange expert lecture by industry person in the area of instrumentation.



## SUGGESTED LEARNING RESOURCES

### PP) Books

Sr. No.	Title of Book	Author	Publication (with year)
1	Electronic Instrumentation and Measurement Technique	W. D. Cooper	Prentice Hall India
2	Electrical and Electronic Measurements and Instrumentation	A.K.Sawhney	Dhanpat Rai & Sons.
3	Transducers & Instrumentation	D. V. S. Murty	Prentice Hall India
4	Electronic Instrumentation	H.S.Kalsi	Mc Graw Hill

### QQ) Major Equipment/ Instrument with Broad Specifications

1. Digital Storage oscilloscope (100MHz, 2GS/sec)
2. Function generator. (1MHz)
3. Frequency counter. (1GHz)
4. LCR-Q meter.

### RR) Software/Learning/ [Simulations](#) Websites

1. [www.electronics-tutorials.com](http://www.electronics-tutorials.com)
2. [www.indianscientificinstrument.com](http://www.indianscientificinstrument.com).
3. <http://boson.physics.sc.edu/~hoskins/Demos/CathodeRay.html>

### Mapping matrix of PO's and CO's:

Course Outcome	Program Outcome								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO-1	3	1	1	2	-	-	1	2	1
CO-2	2	2	1	2	-	-	1	2	2
CO-3	2	2	1	2	-	-	1	2	1
CO-4	3	2	2	2	1	-	2	2	2
CO-5	2	1	1	2	-	-	2	2	1
CO-6	2	1	1	1	-	-	2	2	1

**H: High(3) M: Moderate(2) and L:Low(1) Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE: APPLIED ELECTRONICS** **COURSE CODE: R18 EX4501**  
**COURSE CATEGORY: APPLIED** **CREDIT : 8**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	4	3	80	20	50	--	50	200

**Rationale:**

As an applied technology subject, it intends to teach operating principle and application of electronic circuits and devices like amplifiers, oscillators, switching circuits, wave shaping circuits. The subject knowledge is required in Industrial electronics, Instrumentation and Communication system. Understanding of the subject will provide skill to the students for trouble shooting & testing of some of circuits & devices.

**Course Outcomes:**

**The student will be able to:**

1. Draw and distinguish construction and terminology of Power and Triggering Devices.
2. Analyze the Triggering and commutation circuits.
3. Evaluate and Test the devices, various amplifiers & oscillator circuits based on their Characteristics.
4. Compare the specifications and applications of devices.
5. Interpret, recommend and build circuits using electronic devices with given power ratings for specified electronic Systems.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
1	<b>Electronics Devices &amp; Thyristor family :</b> <b>1.1 Power diode</b> Constructional detail, symbol, Operation and Characteristics ,Typical Ratings and simple application circuits. <b>1.2 SCR</b> Constructional detail,	1a. Reproduce the Construction of Electronic Devices 1b. Describe of the working operation of thyristor family 1c. Label characteristics of Thyristor family and define terms $V_{bo}$ , $I_L$ , $I_H$ , $V_{bd}$ . 1d. Compare the typical	12	16

	<p>symbol ,Operation and Characteristics -Vbo, IL, IH, Vbd , equivalent circuit ,Typical Ratings and simple application circuits.</p> <p><b>1.3 TRIAC</b> Constructional detail, symbol ,four quadrant Operation and V-I Characteristics ,Typical Ratings and equivalent circuit ,simple application circuits.</p> <p><b>1.4 GTO</b> Constructional detail, symbol ,Operation and V-I Characteristics, Typical Ratings and equivalent circuit of GTO, simple application Circuits</p>	<p>ratings of different devices from Thyristor family</p> <p>1e. Draw equivalent circuits of SCR,TRIAC, GTO.</p> <p>1f. Identify the specific applications of Devices</p>		
<b>2</b>	<p><b>Triggering devices :</b></p> <p><b>2.1 DIAC</b> Constructional detail, symbol , Operation and V-I Characteristics Typical Ratings and equivalent circuit ,simple application circuits .</p> <p><b>2.2 UJT</b> Constructional detail, symbol , Operation and V-I Characteristics Typical Ratings and equivalent circuit ,simple application circuits.</p> <p><b>2.3 PUT</b> Constructional detail, symbol , Operation and V-I Characteristics Typical Ratings and equivalent circuit ,simple application circuits , Comparison with UJT.</p> <p><b>2.4 LASCR</b> Constructional detail, symbol , Operation and V-I Characteristics, Typical Ratings, simple application circuits, Comparison with SCR.</p>	<p>2a. Reproduce Construction details of different triggering devices</p> <p>2b. Explain the particular use of Triggering devices based on their ratings</p> <p>2c. Write operation of DIAC,UJT,PUT,LASCR</p> <p>2d. Differentiate among triggering device based on their Characteristics</p> <p>2e. Construct applications of Triggering Circuits</p> <p>2e.Compare the similar looking devices like PUT and UJT,SCR with LASCR</p>	<b>10</b>	<b>12</b>

<b>3</b>	<b>Principle of Triggering &amp; Commutation circuit</b> 3.1 Turn on method of SCR & Triac - Large $V_{AK} \geq V_{BO}$ , 3.2 Gate triggering. 3.3 dv/dt triggering. 3.4 Turn on requirement. 3.5 Triggering circuit. 3.6 Turn off mechanism. 3.7 Turn off circuit. 3.8 Commutation methods Class-A, Class-B, 3.9 Class-C, Class-D, Class-E with Waveforms.	3j. Write the working principal of Triggering circuits and different types of Turn on method and requirements.  3k. Compare different types of triggering methods 3l. Explain the working principal of Commutation methods Class-A, B, C, D, and E. 3m. Draw waveforms for commutation methods	<b>10</b>	<b>12</b>
<b>UNIT 4</b>	<b>FET &amp; MOS FET DEVICES:-</b> <b>1.1</b> Introduction to FET with principle, Advantage and disadvantage. <b>1.2</b> Basic construction of JFET, symbolic representation, Classification as P and N channel JFET, Characteristics curves – Channel, ohmic regions and pinch-off region. <b>1.3</b> Characteristic parameters of JFET ( $r_d$ , $g_{fs}$ , amplification factor, $i_{dss}$ , $p_d$ , $igss$ ). <b>1.4</b> Need of biasing in JFET and types- voltage, self and fixed biasing methods. Comparison of BJT and FET . <b>1.5</b> Examples on parameters of JFET ( $r_d$ , $g_{fs}$ , amplification factor, $i_{dss}$ , $p_d$ , $igss$ ). <b>1.6</b> Introduction to MOSFET , operating principle, Comparison of BJT / FET/MOSFET.	4a. Explain the basic concept of FET & MOSFET Devices  4b. Draw the construction and characteristics of JFET and MOSFET  4c. classify P channel and N channel JFET.  4d. Use the characteristic parameters of JFET in solving examples  4e. Define the terms: $r_d$ , $g_{fs}$ , amplification factor , $i_{dss}$ , $p_d$ , $igss$  4f. Solve the numerical based on characteristics of FET and MOSFET.  4g. Justify the need of Biasing in JFET and different biasing methods  4h. Compare the BJT, FET and MOSFET	<b>10</b>	<b>12</b>
<b>UNIT 5</b>	<b>Negative feedback amplifier and oscillator :</b>	5a. State the general theory of	<b>12</b>	

	<p><b>5.1</b> General theory of feedback, Positive and negative feedback.</p> <p><b>5.2</b> Advantage and disadvantage of negative feedback with Comparison of positive and negative feedback .</p> <p><b>5.3</b> Different types of negative feedbacks voltage series feedback, voltage shunt feedback , current series feedback, current shunt feedback.</p> <p><b>5.4</b> Simple examples on parameters of negative feedback amplifier</p> <p><b>5.5</b> Requirement of positive feedback with Criterion for sustained oscillations.</p> <p><b>5.6</b> Tank circuit and Types of oscillators</p> <p><b>5.7</b> RC phase shift oscillator with design and examples</p> <p><b>5.8</b> Crystal oscillator with design and examples.</p>	<p>Positive and Negative feedback</p> <p>5b. Compare the positive and negative feedback</p> <p>5c. Classify different types of negative feedback voltage series and shunt feedback, current series and shunt feedback.</p> <p>5d. Describe requirement of positive feedback</p> <p>5e. Explain the working principal of Tank circuits and Oscillators like RC phase shift oscillator and crystal oscillator</p> <p>4f.Solve the numerical based on oscillators.</p>		<b>16</b>
<b>UNIT 6</b>	<p><b>Industrial Applications of FET and MOSFET</b></p> <p><b>6.1</b> FET as a common source amplifier.</p> <p><b>6.2</b> FET as a common drain amplifier.</p> <p><b>6.3</b> FET as a common gate amplifier.</p> <p><b>6.4</b> Dual gate FET mixer.</p> <p><b>6.5</b> FET as voltage variable resistor.</p> <p><b>6.6</b> Differential amplifier using FET.</p> <p><b>6.7</b> MOSFET as a switch.</p> <p><b>6.8</b> Application of DEMOSFET as amplifier.</p> <p><b>6.9</b> EMOSFET as linear amplifier.</p> <p><b>6.10</b> CMOS inverter.</p>	<p>6a. Rewrite the applications of FET and MOSFET</p> <p>6b. Explain FET as a different types of amplifier</p> <p>6c. Describe working principal of MOSFET as a Switch</p> <p>6d. Draw the application of DEMOSFET as amplifier</p> <p>6e.Construct the CMOS inverter.</p>	<b>10</b>	<b>12</b>

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit	Unit Title	Teaching	Distribution of Theory Marks
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No.		Hours	R Level	U Level	A Level	Total Marks
1	Electronics Devices & Thyristor family	12	4	8	4	16
2	Triggering devices	10	4	4	4	12
3	Principle of Triggering & Commutation circuit	10	4	4	4	12
4	FET & MOS FET DEVICES	10	2	8	2	12
5	Negative feedback amplifier and oscillator	12	4	4	8	16
6	Industrial Applications of FET and MOSFET	10	2	2	8	12
	<b>Total</b>	<b>64</b>	<b>20</b>	<b>28</b>	<b>30</b>	<b>80</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

#### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1.	1	To plot and verify V-I Characteristics of SCR.	2
2.	1	To plot and verify V-I Characteristics of TRIAC.	2
3.	2	To plot and verify V-I Characteristics of DIAC	2
4.	2	To plot and verify V-I Characteristics of UJT	2
5.	2	To verify operation of Lamp dimmer circuit	2
6.	2	To verify operation and plot waveforms for UJT as a relaxation oscillator.	2
7.	3	Observe the effects of variation of R, C in R and RC triggering circuits on firing angle of SCR.	2
8.	3	Observe the effect of variation of R on firing angle in UJT triggering circuit.	2
9.	3	To study and verify operation of commutation circuit class A	2
10.	3	To study and verify operation of commutation circuit class B.	2
11.	3	To study and verify operation of commutation circuit class D.	2
12.	4	To plot and verify Transfer and Drain Characteristics of FET	2
13.	4	To plot and verify Transfer and Drain Characteristics of MOSFET.	2

<b>14.</b>	<b>5</b>	To test amplifier circuit with voltage series, shunt type of feedbacks.	<b>2</b>
<b>15.</b>	<b>5</b>	To test amplifier circuit with current series, shunt type of feedbacks.	<b>2</b>
<b>16.</b>	<b>5</b>	To test given oscillator circuits-RC Phase shift.	<b>2</b>
<b>17.</b>	<b>6</b>	Measurement of parameters of FET Common Source amplifier.	<b>2</b>
<b>18.</b>	<b>6</b>	To verify operation of FET as voltage variable resistor.	<b>2</b>
<b>19.</b>	<b>6</b>	To verify operation of MOSFET as switch.	<b>2</b>
<b>20.</b>	<b>6</b>	To verify operation of MOSFET as Linear amplifier	<b>2</b>
<b>Total</b>			

### **SUGGESTED STUDENT ACTIVITIES**

Following is the list of proposed student activities like

1. Design different application based on Power and triggering devices.
2. Visit a nearby repairing shop and understand steps of troubleshooting.
3. Download datasheets for all devices used in Lab experiments.
4. Implement small application based on acquired knowledge.

### **SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

1. Use of Power Point presentation in detailing constructions and application of devices.
2. Arrange a visit to any Industry.
3. Arrange expert lecture of an industry person with design knowledge.
4. Present animated video of working and characteristics of devices.
5. Involve students to build and troubleshooting general application circuits.

### **SUGGESTED LEARNING RESOURCES**

**SS) Books**

Sl. No.	Title of Book	Author	Publication
1.	Electronic Principles	Paul Malvino	Tata McGraw-Hill
2.	Electronics Devices & Circuits	AllenMottershed	Prantice Hall India
3.	Pulse Digital & Switching Waveforms	J.Millman and H Taub	Tata McGraw-Hill
4.	Pulse & Digital Electronics	G.K.Mittal and A.R.Vanvasai	Khanna Publication
5.	Power Electronics	M D Singh K B Khanchandani	Tata McGraw-Hill
6.	Electronic Devices and Circuits	David Bell	Prantice Hall India

**TT) Major Equipment/ Instrument with Broad Specifications**

1. Digital Storage oscilloscope/ Cathode ray oscilloscope
2. Regulated power supply
3. CRO Probes and connecting wires
4. Experimental kit of SCR characteristic.
5. Experimental kit of Triac characteristic
6. Experimental kit of Mosfet characteristic
7. Experimental kit of UJT relaxation Oscillator
8. Experimental kit of Mosfet as Switch
9. Experimental kit of SCR Commutation Methods
10. Experimental kit of feedback Amplifiers.
11. MATLAB software with simulink and toolbox

**UU) Software/Learning/ Simulations Websites**

1. [www.nptel.com](http://www.nptel.com)
2. [www.electronics-tutorials.com](http://www.electronics-tutorials.com)
3. [www.allaboutcircuit.com](http://www.allaboutcircuit.com)
4. [www.electronicstutorial.com](http://www.electronicstutorial.com).



**VV) Mapping matrix of PO's/PSO's and CO's:**

Course Outcome	Program Outcome							Program specific outcome	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
<b>CO1</b>	3	2	1	2	1	-	1	3	2
<b>CO2</b>	2	1	2	2	-	1	-	2	1
<b>CO3</b>	1	2	2	3	1	1	1	1	3
<b>CO4</b>	2	1	2	2	-	1	1	2	1
<b>CO5</b>	1	3	2	1	2	2	1	1	3

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : ELECTRONICS LAB PRACTICE-II COURSE CODE: R18 EX4502**  
**COURSE CATEGORY : Applied CREDIT : 04**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
-	04	-	-	-	-	50	50	100

**Rationale:**

This course gives the basic introduction of electronic hardware systems and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such systems by making use of the various tools and instruments available in the Electronics Workshop.

**Course Outcomes:**

1. Measure the electrical quantities using appropriate equipment.
2. Understand the working of electronic components.
3. Build and test the electronic circuits.
4. Solve the electronic problems using MATLAB
5. Design an Artwork and test the circuit using PCB.

**Course Details:**

UNIT	NAME OF THE TOPIC (with Details)	LEARNING OUTCOME ( After this course the students able to-)	HOURS	MARKS
1	<b>Electronics test and Measuring equipments-</b> <ol style="list-style-type: none"> <li>1. CRO- voltage, frequency, current, P-P voltage, Peak voltage.</li> <li>2. Power Supply- current and voltage control, dual power supply.</li> <li>3. Signal generators- Basic Signals, DC offset, frequency adjustment.</li> <li>4. DMM- Resistance, Voltage, current measurement, Transistor <math>\beta</math> measurement.</li> <li>5. Frequency counters- frequency and pulse measurement.</li> <li>6. High current Probes.</li> </ol>	<ol style="list-style-type: none"> <li>1. Select the appropriate equipment for measurement of parameter.</li> <li>2. Measure the electrical quantity form given source</li> </ol>	10	
2	<b>Testing of components-</b> <ol style="list-style-type: none"> <li>1. Solder less boards ( Breadboard)</li> </ol>	<ol style="list-style-type: none"> <li>1. Describe the working of given circuit.</li> </ol>	10	

	2. Test circuits for- <ol style="list-style-type: none"> <li>How resistor , capacitor, potentiometer, inductor works.</li> <li>How diode's, transistor, FET,SCR works.</li> <li>How photocell, speaker, microphone works.</li> <li>How OP-Amp, 555 timer works</li> </ol>	2. Build the circuit. 3. Test and troubleshoot the circuit.		
3	<b>Circuit Testing-1</b> <ol style="list-style-type: none"> <li>Burglar alarm</li> <li>Automatic light lamp.</li> <li>DC to DC power supply.</li> <li>Electronic Metronome.</li> <li>Electronic motor cycle sound.</li> <li>Railroad Lights.</li> <li>Continuity Tester.</li> <li>Variable speed lights.</li> <li>Count down Timer using Arduino.</li> </ol>	<ol style="list-style-type: none"> <li>Identify the given components</li> <li>Sketch the circuit diagram.</li> <li>Build the circuit.</li> <li>Test and troubleshoot the circuit.</li> </ol>	12	
4	<b>Circuit Testing- 2</b> <ol style="list-style-type: none"> <li>Audio Generator.</li> <li>Electronic siren.</li> <li>Variable timer.</li> <li>Morse code oscillator.</li> <li>Nose beeper .</li> <li>Insanity alarm .</li> <li>Electronic organ</li> <li>Decade counter/ divider 4026</li> </ol>	<ol style="list-style-type: none"> <li>Identify the given components</li> <li>Sketch the circuit diagram.</li> <li>Build the circuit.</li> <li>Test and troubleshoot the circuit.</li> </ol>	12	
5	<b>MATLAB programming-</b> <ol style="list-style-type: none"> <li>Polynomials</li> <li>Graphics</li> <li>Differential equations.</li> <li>Simple electronic circuit analysis</li> </ol>	<ol style="list-style-type: none"> <li>Describe the commands of MATLAB.</li> <li>Apply the commands to solve the problems.</li> </ol>	10	
6	<b>PCB Design-</b> <ol style="list-style-type: none"> <li>Artwork rules-Single and double sided PCB</li> <li>Artwork Layout- a. Manual artwork. B. using software.</li> <li>Copper clad Types.</li> <li>PCB fabrication using conductive Ink.</li> </ol>	<ol style="list-style-type: none"> <li>Explain the rules for single and double sided PCB.</li> <li>Sketch the Manual artwork for given circuit.</li> <li>Generate the artwork for</li> </ol>	10	

		<p>given circuit using software.</p> <p>4. Identify the copper clads.</p> <p>5. Identify the given PCB's.</p> <p>6. Design the artwork using conductive ink for given circuit .</p>		
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### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Electronics test and Measuring equipments	-	-	-	-	-
2	Testing of components	-	-	-	-	-
3	Circuit Testing-1	-	-	-	-	-
4	Circuit Testing-2	-	-	-	-	-
5	MATLAB programming	-	-	-	-	-
6	PCB Design	-	-	-	-	-
	Total	-	-	-	-	-

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	1	CRO/DSO specifications and Measurements of voltage, current, frequency, Amplitude (P-P, Peak)	2
2	1	<p>a. Laboratory power supply specifications, Dual power supply applications, Voltage and current controlled, over voltage and over current testing.</p> <p>b. DMM specifications and measurements of voltage (RMS), resistance, current.</p>	4
3	1	<p>a. Signal Generators specifications, Basic output signals such as sine, square, Triangular, pulse, Adding DC offset.</p> <p>b. Frequency counters specifications, Measurements of frequencies.</p>	4

4	2	Basic application circuits to understand the working of electronic components- Resistor, Capacitor, potentiometer, Inductor	4
5	2	Basic application circuits to understand the working of electronic Devices- Diode's, Transistor's, SCR, FET.	4
6	2	Basic application circuits to understand the working of electronic Devices- Photocell, IC 555, Speaker, Microphone.	4
7	3	1. Burglar alarm 2. Automatic light lamp.	4
8	3	1. DC to DC power supply. 2. Electronic Metronome	2
9	3	1. Electronic motor cycle sound. 2. Railroad Lights.	2
10	3	1. Continuity Tester. 2. Variable speed lights.	2
11	3	1. Relay Switching circuit	4
12	4	1. Audio Generator. 2. Electronic siren.	2
13	4	1. Variable timer. 2. Morse code oscillator	4
14	4	1. Nose beeper. 2. Insanity alarm.	2
15	4	1. Electronic organ 2. Decade counter/ divider 4026	4
16	5	R-C Network Mesh analysis using MATLAB	2
17	5	Single node –pair circuit analysis using MATLAB	2
18	5	R-L-C network analysis using MATLAB	2
19	6	Manual PCB Artwork and implementation of circuit	4
20	6	PCB Artwork using software.	4
<b>Total</b>			<b>64</b>

### SUGGESTED STUDENT ACTIVITIES

1. Market survey for component availability and their prices.

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

## SUGGESTED LEARNING RESOURCES

### WW) Books

Sl. No.	Title of Book	Author	Publication (with year)
1	Circuit Analysis –I with MATLAB Applications	Steven T. Karris	Orchard Publications, Fremont, California www.orchardpublications.com
2	Electronic Circuits	Tutorials point	Tutorialspoint.com
3	Printed circuit Board design and technology	Bosshart	Tata Mac-Graw Hill education

### XX) Major Equipment/ Instrument with Broad Specifications

### YY) Software/Learning/ [Simulations](#) Websites

### Mapping matrix of PO's and CO's:

Course Outcomes	Program Outcomes							PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	2	-	3	-	-	2	3	3
CO2	3	2	-	3	2	-	3	3	3
CO3	1	3	3	3	2	-	2	3	3
CO4	2	3	3	3	2	2	1	3	3
CO5	2	3	3	3	2	2	2	3	3

**H: High M: Moderate and L:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATIONS ENGINEERING**  
**COURSE: POWER ELECTRONICS** **COURSE CODE: R18 EX4503**  
**COURSE CATEGORY: APPLIED** **CREDIT : 6**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	2	3	80	20	25	--	25	150

**Rationale:**

Power electronics is a branch of engineering devoted to conversion & control of electric power using electronic converters based on semiconductor power switches, like thyristor power transistor, power MOSFET, IGBT. The vast application area of power electronics include power conditioner, electric lighting, power distribution, generation, transmission, process control & factory automation & electromechanical application like welding, electroplating, induction heating etc.

**Course Outcomes: The student will be able to:**

1. Relate operating principle for selecting Power devices for intended specification.
2. Draw and analyze practical waveforms for Power conversion circuits.
3. Construct and categorize types of controlled rectifier and inverter circuit according to supply types and loads.
4. Identify and recommend appropriate chopper or Ac converter circuit for control of DC or AC motors.
5. Select Uninterruptable power supply with proper capacity, KVA rating and back up time for given applications.

**Course Details:**

UNIT	NAME OF THE REVISED TOPIC	Learning Outcome	HOURS	MARKS
1	<b>Power switching Devices:</b>  <b>Power BJT</b> Constructional detail symbol, operation, Characteristics: input and output Characteristics (cutoff, saturation and linear regions)  <b>MOSFET</b> Constructional detail symbol, operation, Characteristics: steady state characteristics: transfer and input and output Characteristics(cutoff, saturation and linear regions)	1 a. Reproduce the Construction of Power Devices  1b. Describe of the working operation of Power devices  1c. Label output characteristics of Power BJT, MOSFET and IGBT  1d. Compare the typical ratings of different power devices  1e. Draw equivalent circuits of	12	16

	<p>Types Enhancement and depletion type</p> <p>Comparison of Enhancement and depletion type</p> <p>Equivalent circuit, Typical Ratings</p> <p><b>IGBT</b></p> <p>Constructional detail symbol, operation,</p> <p>Characteristics: steady state characteristics: transfer and input and output</p> <p>Characteristics(cutoff, saturation and linear regions)</p> <p>Types punch through and non punch through type</p> <p>Comparison of punch through and non punch through type Equivalent circuit, Typical Ratings</p> <p><b>control and driving circuits</b></p> <p>Simple driving circuits</p> <p>Totem pole driving circuits</p> <p>Isolated driving circuits</p> <p>Pulse transformer and Optocoupler type</p> <p>IGBT Driving circuit with over current protection</p>	<p>Power BJT ,MOSFET and IGBT.</p> <p>1f. Identify the specific applications of Power Devices</p> <p>1g. Explain requirement of Driving and driving circuit for MOSFET and IGBT</p>		
<b>2</b>	<p><b>Controlled Rectifiers -</b></p> <p>Single phase half wave controlled rectifier: circuit operation and waveforms with resistive load</p> <p>Effect of free wheeling diode</p> <p>Single phase half wave controlled rectifier: circuit operation and waveforms R-L load</p> <p>Single phase full wave controlled rectifier: circuit operation and waveforms with resistive load</p> <p>Single phase full wave controlled rectifier: circuit operation and waveforms R-L load</p> <p>Single phase controlled bridge rectifier circuit operation and waveforms</p>	<p>2.a.Categorize different rectifiers</p> <p>2.b.Explain concept of phase control</p> <p>2.c.Draw input and output waveforms for R and Rl load</p> <p>2.d.Explain need of freewheeling diode for Rl load</p> <p>2.d.State advantages of three phase controlled rectifier over single phase controlled rectifier</p> <p>2.e. Identify the specific applications of controlled</p>	10	12



	<p>Three phase controlled converter – three pulse converter circuit operation and waveforms for R and RL load</p> <p>Six pulse converter circuit operation and waveforms RL load</p> <p>Three phase controlled bridge converter circuit operation and waveforms for R and RL load</p>	rectifier		
<b>3</b>	<p><b>Inverters-</b></p> <p>Single phase inverter-Principle and operation of half-bridge and waveforms,</p> <p>full bridge Single phase inverter circuit operation and waveforms</p> <p>Three phase inverter- voltage source inverter- 120 degree modes of circuit operation and waveforms</p> <p>180 degree modes of circuit operation and waveforms</p> <p>Current source Inverter- 1 phase and 3 phase with R load circuit operation and waveforms,</p> <p>Comparison between VSI and CSI</p> <p>PWM Techniques:</p> <p>Single pwm Principle and operation and waveforms,</p> <p>Multi pwm Principle and operation and waveforms,</p> <p>Sine pwm, Principle and operation and waveforms,</p> <p>Comparison between different PWM techniques</p> <p>PWM inverter: Principle and operation of half-bridge and waveforms,</p> <p>Single phase full bridge PWM inverter circuit operation and waveforms</p>	<p>3.a. Describe the principle of Inversion and state its need</p> <p>3.b. Categorize Inverter</p> <p>3.c. Draw Circuit Diagram and waveform also explain operation of single phase half and full bridge Inverter</p> <p>3.d. Reproduce waveforms and explain operation of three phase Voltage source Inverter (120 and 180 degree)</p> <p>3.e. Compare Voltage source inverter with current source inverter</p> <p>3.f. Describe advantages of Pulse width modulation and its types.</p> <p>3.g Justify better controlled output using PWM inverter</p>	10	12
<b>4</b>	<p><b>Choppers -</b></p> <p>Basic chopper circuit operation and</p>	<p>4.a. Describe the principle of chopper and state its need of static switches</p>	12	16

	<p>waveforms,</p> <p>Classification of chopper: according to o/p voltage</p> <p>Step up circuit operation and waveforms and derivation of o/p voltage</p> <p>Step down chopper circuit operation and waveforms and derivation of o/p voltage</p> <p>Control strategies : Time ratio control (constant frequency and variable frequency method )</p> <p>Jones chopper, Ac chopper, circuit operation and waveforms</p> <p>multiphase chopper, circuit operation and waveforms</p> <p>Chopper control of Dc series motor.</p>	<p>4.b. Categorize choppers</p> <p>4.c. Draw Circuit Diagram and waveform also explain operation of step up and step down chopper</p> <p>4.d. Reproduce waveforms and explain operation of control strategies of chopper</p> <p>4.e.Explain circuit and waveforms for Jones chopper, multiphase chopper, Ac chopper</p> <p>4.f. Describe advantages of Pulse width modulation.</p>		
<b>5</b>	<p><b>AC converters</b>-Single phase A.C Voltage controller</p> <p>Single phase to single phase Cycloconverter circuit operation and waveforms.</p> <p>Three phase half wave Cycloconverter circuit operation and waveforms.(intergroup reactor function)</p> <p>Dual Converter-need and advantage</p> <p>Ideal dual converter operation and waveforms and derivation</p> <p>1 phase dual converter circuit operation and waveforms</p> <p>3 phase dual converter circuit operation and waveforms</p> <p>Dual converter with and without circulating current circuit operation and waveforms.</p> <p>Comparison between non circulating and circulating current mode</p> <p>Dual mode dual converter circuit operation</p>	<p>5.a. Rewrite the principle of Cycloconverter and state its applications</p> <p>5.b. Categorize Cycloconverter</p> <p>5.c. Draw Circuit Diagram and waveform also explain operation of types of Cycloconverter</p> <p>5.d. Reproduce waveforms and explain operation of control strategies of dual converter</p> <p>5.e.Explain circuit and waveforms for dual mode dual converter</p> <p>5.f. Compare circulating and non circulating dual converter</p>	10	12

	and waveforms			
<b>6</b>	<b>Uninterrupted Power Supply(UPS)</b> Concept of Ups system and types with applications Block diagram of ON-Line Ups system Block diagram of Off Line Ups system Block diagram of Line-interactive Ups system Types of batteries Battery capacity Battery efficiency-AH and WH efficiency Calculation of battery VA ratings with example Charger and inverter ratings and back-up times calculations Examples on calculation of battery capacity and selection Comparison of ON-Line Ups and Off Line UPS system	6.a. Draw Block diagram for UPS 6. b. List types of UPS. 6.c. Justify On –Line UPS as better than other types of UPS 6.d.Select battery for required application 6.e calculate battery efficiency. 6.f Solve examples on battery KVA rating and capacity with backup time	10	12

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
<b>1</b>	<b>Power switching Devices</b>	<b>12</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>16</b>
<b>2</b>	<b>Controlled Rectifiers</b>	<b>10</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>12</b>
<b>3</b>	<b>Inverters</b>	<b>10</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>12</b>
<b>4</b>	<b>Choppers</b>	<b>12</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>16</b>
<b>5</b>	<b>AC converters</b>	<b>10</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>12</b>
<b>6</b>	<b>Uninterrupted Power Supply(UPS)</b>	<b>10</b>	<b>2</b>	<b>2</b>	<b>8</b>	<b>12</b>
<b>Total</b>		<b>64</b>	<b>22</b>	<b>30</b>	<b>28</b>	<b>80</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	1	To plot drain and transfer characteristics of MOSFET	2
2	1	To plot Collector and transfer characteristics of IGBT	2
3	1	To verify operation of MOSFET Driving Circuit.	2
4	2	To verify Input and output waveforms of Single phase half (semi converter )controlled rectifier	2
5	2	To verify Input and output waveforms of single phase full wave controlled rectifier	2
6	3	To verify Input and output waveforms of 3 Phase V.S.I. (voltage source Inverter)	2
7	3	To verify Input and output waveforms of 3 Phase CSI (Current source Inverter)	2
8	4	To verify Input and output waveforms of SCR based Dc Jone's chopper	2
9	5	To study and verify operation of speed control of DC Motor using Two quadrants Chopper.	2
10	5	To verify output waveforms of Single AC Voltage controller.	2
11	5	To verify Input and output waveforms of AC cyclo converter	2
12	6	To verify operation of UPS and calculation of KVA rating of UPS	2
<b>Total</b>			<b>24</b>

### SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like

1. Design different application based on Power and triggering devices.
2. Visit a nearby repairing shop and understand steps of troubleshooting.
3. Download datasheets for all devices used in Lab experiments.
4. Implement small application based on acquired knowledge.

**SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

- I. Use of Power Point presentation in detailing constructions and application of devices.
- II. Arrange a visit to any Industry.
- III. Arrange expert lecture of an industry person with design knowledge.
- IV. Present animated video of working and characteristics of devices.
- V. Involve students to build and troubleshooting general application circuits.

**SUGGESTED LEARNING RESOURCES****ZZ) Books**

Sr.No.	Title of Book	Author	Publication
1.	Power Electronics 2nd	Muhammad H. Rashid	Tata McGraw Hill
2.	Power Electronics	M.D.Singh & Khanchandani	Tata McGraw Hill
3.	Power Electronics	P.C. Sen	PH.I
4.	Introduction Thyristors	Rammorthy	East West Press Pvt. Ltd.
5.	Power Electronics	Mohan/Undelend/Robbins	John Wiley & Sons
6.	Power Electronics	C.W. Lander	McGraw Hill
7.	Vedam Subhahmanyam	Electric drives	Tata McGraw Hill

**AAA) Major Equipment/ Instrument with Broad Specifications**

1. Digital Storage oscilloscope/ Cathode ray oscilloscope
2. Regulated power supply
3. CRO Probes and connecting wires
4. Experimental kit of MOSFET characteristic.
5. Experimental kit of IGBT characteristic
6. Experimental kit of Single phase half wave controlled rectifier
7. Experimental kit of single phase full wave controlled rectifier
8. Experimental kit of 3 Phase V.S.I. (voltage source Inverter)
9. Experimental kit of 3 Phase CSI (Current source Inverter)
10. Experimental kit of SCR based Dc Jone's chopper.
11. Experimental kit of DC Motor using Two quadrants Chopper.
12. Experimental kit of Single AC Voltage controller
13. Experimental kit of AC cyclo converter
14. Experimental kit of Dual converter.
15. MATLAB software with simulink and toolbox

**BBB) Software/Learning/ Simulations Websites**

1. [www.nptel.com](http://www.nptel.com)
2. [www.allaboutcircuit.com](http://www.allaboutcircuit.com)
3. [www.electronicstutorial.com](http://www.electronicstutorial.com).

**CCC) Mapping matrix of PO's and CO's:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	2	2	3	1	1	1	3	2
CO2	2	3	3	2	-	1	1	2	2
CO3	3	3	2	3	1	1	-	2	1
CO4	2	2	1	2	1	1	1	1	2
CO5	1	3	3	3	2	1	1	1	3

**3: High 2: Moderate and 1:Low Relationship**



	EEPROM, FLASH & NVRAM. 1.6 Pin diagram and description of 8051 microcontroller. 1.7 Architecture of 8051 Microcontroller. 1.8 Resister Bank and PSW. 1.9 Internal and external memory organization. 1.10 Specification and comparison of 8051 and 8951	1d. Explain block diagram of microcontroller 1e. Compare versions of microcontrollers 1f. Explain memory organization of 8051 microcontroller with neat diagrams.		
<b>2</b>	<b>8051 Assembly language programming.</b> 2.1 Development systems tools- Editor, Assembler, Linker, Debugger. 2.2 8051 Data types & Directives- Decimal, Hex and Binary. Directives (ORG,EQU, END) 2.3 Loop instruction and programs. 2.4 Jump instructions-conditional & unconditional, 2.5 Stack –Push & Pop instructions, 2.6 Subroutine – Call instructions, 2.7 Programs on jump and call instruction, 2.8 Time delay generation machine cycle, Delay calculations for 8051	2a.Explain the function of the given software development tools. 2b.Explain the use of the given assembler directives with examples 2c.Describe the function of the given instruction with suitable examples. 2d.Calculate Machine cycle time for given clock frequency	<b>10</b>	<b>12</b>
<b>3</b>	<b>Addressing Modes of 8051</b> 3.1 Addressing Modes of 8051 3.2 Data transfer and arithmetic instructions 3.3 Logical and compare instructions 3.4 Rotate and swap instructions. 3.5 BCD & ASCII Applications 3.6 I/O Programming-bit manipulation instructions	3a.Identify the addressing mode of the given instruction. 3b.Describe the function of the given instruction with suitable examples. 3c.Write an assembly language program for the given operation. 3d.Write an ALP to generate the given waveform on given port.	<b>10</b>	<b>12</b>
<b>4</b>	<b>Programming 8051 for timers and serial communication</b> 4.1 Basic resisters of Timer. 4.2 TMOD register. 4.3 Mode 1 Programming. 4.4 Mode 2 Programming. 4.5 Counter programming. 4.6 TCON register. 4.7 Programs on timers. 4.8 Serial communication- SFRs: SCON, SBUF. 4.9 Serial port programming in	4a. Explain the timer mode register. 4b.Explain operation of the given mode for timer and counter with suitable diagram. 4c.Explain SCON Register. 4d.Generate the waveforms by using the given mode of timer	<b>10</b>	<b>12</b>



	assembly. 4.10 Interrupts-SFRs:- IE, IP IE register			
<b>5</b>	<b>8051Memory and I/O device interfacing</b> 5.1 Interfacing with external ROM. Interfacing with external RAM. 5.2 ADC 0808/0809 interfacing and Programming. 5.3 DAC 0808 Interfacing –Generation of Square wave, Triangular wave. 5.4 Keyboard Interfacing (simple program) 5.5 Interfacing and programming of LEDs. 5.6 Interfacing and programming of 7-segment. 5.7 LCD interfacing- Initialization, programming. 5.8 DC and Stepper motor interfacing with Programs.	5a.Draw Interface diagram and explain interfacing of peripherals with 8051 such as ADC, DAC, Keyboard, LEDs, 7-segment and LCD display, DC and Stepper Motor. 5b.Develop assembly language program to use peripherals with 8051 such as ADC, DAC, Keyboard, LEDs, 7-segment and LCD display, DC and Stepper Motor.	<b>12</b>	<b>16</b>
<b>6</b>	<b>Introduction to PIC Microcontrollers</b> 6.1 PIC microcontroller overview 6.2 PIC microcontroller features 6.3 PIC 18FXX 6.4 PIC 18FXX block diagram 6.5 PIC reset action 6.6 PIC oscillator connections 6.7 PIC memory organization 6.8 PIC addressing modes.	6a. Compare 8051 and PIC 18FXX microcontroller. 6b. Explain block diagram of PIC 18FXX microcontroller 6c. Explain memory organization of PIC microcontroller with neat diagrams.	<b>10</b>	<b>12</b>

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
<b>1</b>	<b>The 8051 Microcontroller</b>	<b>12</b>	<b>08</b>	<b>08</b>	<b>-</b>	<b>16</b>
<b>2</b>	<b>8051 assembly language programming.</b>	<b>10</b>	<b>02</b>	<b>06</b>	<b>04</b>	<b>12</b>
<b>3</b>	<b>Addressing Modes of 8051</b>	<b>10</b>	<b>04</b>	<b>04</b>	<b>04</b>	<b>12</b>
<b>4</b>	<b>Programming 8051 for timers and serial communication</b>	<b>10</b>	<b>02</b>	<b>04</b>	<b>06</b>	<b>12</b>

5	8051Memory and I/O device interfacing	12	02	06	08	16
6	Introduction to PIC Microcontrollers	10	04	08	-	12
	Total	64				80

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

#### SUGGESTED EXERCISES/PRACTICALS (Any Sixteen Practicals)

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1.	1	Identify different sections of 8051 kit and use of Keil simulator	2
2.	3	Write and execute an assembly program using simulator 8-bit addition and 8-bit subtraction.	2
3.	3	Write and execute an assembly program using simulator 8-bit Multiplication and 8-bit Division using external memory.	2
4.	3	Write and execute an assembly program using simulator 16-bit addition and 16-bit subtraction.	2
5.	3	Write and execute an assembly program using simulator finding a Square of a given number using lookup table.	2
6.	3	Write and execute an assembly program to find largest number from group of n numbers using simulator.	2
7.	3	Write and execute an assembly program to find smallest number from group of n numbers using simulator.	2
8.	3	Write and execute an assembly program to arrange 5 numbers in ascending using simulator.	2
9.	3	Write and execute an assembly program to arrange 5 numbers in descending using simulator.	2
10.	3	Write and execute an assembly program using simulator to transfer data from source to destination location of internal data memory	2
11.	3	Write and execute an assembly program using simulator to transfer data from source to destination location of external data memory.	2
12.	4	Write and execute an assembly program using simulator to generate square wave or rectangular wave on port pin with a program	2
13.	4	Write and execute an assembly program for serial communication using RS232 to transfer 8 bit data serially	2
14.	4	Write and execute an assembly program to interface and blink LEDs on I/O ports.	2
15.	5	Interface (16x2) LCD with 8051 microcontroller to display the message on it.	2
16.	5	Interface 7 segment display with 8051 microcontroller to display the decimal numbers from 0-9	2
17.	5	Interface DAC with 8051 microcontroller and Generate Triangular waveform.	2

18.	5	Interface ADC with 8051 microcontroller and verify inputs and outputs.	2
19.	5	Interface stepper motor with 8051 microcontroller and to rotate it in clockwise and anticlockwise direction.	2
20.	5	Interface the given keyboard with 8051 and verify input and output.	2
<b>Total</b>			<b>32/40</b>

### SUGGESTED STUDENT ACTIVITIES

Following are the suggested student-related activities; Students should submit the report on activities. (Group of 3 to 4 students and perform the given task)

1. Prepare a chart of architecture of 8051.
2. Prepare chart to represent the interfacing diagram of microcontroller with different peripherals.
3. Give seminar on relevant topic.
4. Undertake a market survey of different microcontrollers.
5. Prepare the comparative report of various microcontrollers 8051.

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Use Flash/Animations to explain the working of Microcontroller.
2. Arrange expert lecture of a person in the area of Microcontroller.
3. Arrange industrial visit.

### SUGGESTED LEARNING RESOURCES

#### DDD) Books

Sr. No.	Title of Book	Author	Publication (with year)
1	The 8051 Microcontroller and Embedded Systems	M. A. Mazidi and J. G. Mazidi	Pearson Education Asia
2	The 8051 microcontroller	K Ayela Predko	Pearson Education Asia
3	Microcontrollers –Architecture, Programming, Interfacing & System Design	Raj Kamal	Pearson Education
4	Microcontrollers –Theory and Applications	Ajay V. Deshmukh	Tata McGraw Hill Companies
5	The PIC Microcontroller and Embedded Systems	M. A. Mazidi and J. G. Mazidi	Pearson Education Asia
6	Embedded System Design Using The 8051 Microcontroller Family	Satish Shah	Benison Education

**EEE) Major Equipment/ Instrument with Broad Specifications**

1. 8051 Microcontroller Trainer Kit.
2. 8051 Simulator Software (Web version)
3. Computer system (Latest version)
4. Peripheral interface kits

**FFF) Software/Learning/ Simulations Websites**

1. Simulation software:-www.keil.com
2. Microcontroller:- www.nptel.ac.in/courses/Webcourse-contents/IITKANPUR/microcontrollers/micro/ui/Course\_home2\_5.htm
3. Memory:- www.slideshare.net/aismahesh/memory-8051
4. 8051 microcontroller:- www.intorobotics.com/8051-microcontroller-programming-tutorials- simulators-compilers-and-programmers/
5. www.8052.com
6. www.nptel.iitm.ac.in

**Mapping matrix of CO's –PO's and PSO's:-**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO-1	1	-	-	2	1	1	2	2	2
CO-2	2	2	2	3	1	2	2	3	3
CO-3	3	3	3	3	1	2	2	3	3
CO-4	2	3	3	3	1	2	2	3	3
CO-5	2	3	3	3	1	2	2	3	3
CO-6	1	-	-	2	1	1	2	3	3

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE: CONSUMER ELECTRONICS**      **COURSE CODE: R18EX4505**  
**COURSE CATEGORY: APPLIED**      **CREDIT : 8**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	4	3	80	20	-	@25	25	150

**@ Internal Assessment**

**Rationale:**

The objective of this subject is to give students an in depth knowledge of various real world circuits. This subject focuses on Hi-Fi audio system, colour television details, home appliances like microwave oven, washing machine etc. It also makes them familiar with many real life medical instruments like BP monitors, thermometers etc. The practical assignments will further reinforce the knowledge and the skill of the students.

**Course Outcomes:**

1. Describe and compare various Audio systems, Loudspeaker, CD, DVD and Blue ray disk.
2. Discuss and analyze Composite video signal, Receiver Picture tube, Television camera tubes and the principles of colour television transmitter and receiver system.
3. Draw and compare standard TV, HDTV, LCD/LED TV and DTH System.
4. Sketch and explain various units of mobile.
5. Describe various consumer products and examine their safety assurance.
6. Write function of various healthcare appliances.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
1	<b>Hi-Fi Audio amplifier and DVD players</b>  1.1 Introduction to amplifiers: mono, stereo, public address 1.2 Comparison of mono, stereo & public address amplifiers 1.3 Block diagram of Hi-Fi amplifier and its working 1.4 Controls available on Hi-Fi	1. To describe audio amplifier 2. To familiar with the block diagram of hi-fi amplifier	12	16

	<p>amplifier and their function</p> <p><b>1.5</b> Graphic equalizer concept- circuit diagram and operation (5 point circuit diagram)</p> <p><b>1.6</b> Significance of graphic equalizer</p> <p><b>1.7</b> Moving Coil loudspeaker</p> <p><b>1.8</b> Types of speakers- woofers, tweeters, mid frequency rangers</p> <p><b>1.9</b> CD - material used, size &amp; capacity</p> <p><b>1.10</b> DVD- material used, size &amp; capacity</p> <p><b>1.11</b> DVD player-Block diagram and working</p> <p><b>1.12</b> Introduction to Blu ray disc and Blu ray disc players</p>			
<b>2</b>	<p><b>COLOUR TELEVISION</b></p> <p><b>2.1</b> Concept- Aspect ratio, image continuity, interlace, scanning, scanning periods,</p> <p><b>2.2</b>Resolution-vertical resolution,horizontal resolution</p> <p><b>2.3</b> Concept-Bandwidth for colour signal.</p> <p><b>2.4</b> Brightness, contrast, viewing distance, luminance, hue, saturation</p> <p><b>2.5</b> Three color theory, grassman's law</p> <p><b>2.6</b> Composite video signal</p> <p><b>2.7</b> TV camera tube, principal and working of solid state camera based on CCD</p> <p><b>2.8</b>Luminance and chrominance signals</p> <p><b>2.9</b> PAL- D encoder- block diagram and working</p> <p><b>2.10</b> PAL- D decoder- block diagram and working</p>	<p>1. To compare black and white TV with colour TV</p> <p>2. To describe composite video signalling</p>	10	12

<p><b>3</b></p>	<p><b>HDTV AND DTH SYSTEMS</b></p> <p><b>3.1</b> Introduction to HDTV</p> <p><b>3.2</b> Comparison of standard TV and HDTV</p> <p><b>3.3</b> HDTV block diagram &amp; working</p> <p><b>3.4</b> LED/LCD technology- principal of working of LCD and LED TV system</p> <p><b>3.5</b> CCTV- applications, different models, lenses used</p> <p><b>3.6</b> Advantages and disadvantages of DTH</p> <p><b>3.7</b> DTH system-block diagram and working</p> <p><b>3.8</b> LNB concept</p> <p><b>3.9</b> specifications of components used in DTH (antenna sizes, the dish etc)</p> <p><b>3.10</b> Set top box-block diagram and working</p>	<p>1. To demonstrate HDTV and DTH systems</p> <p>2. To know the specifications of HDTV</p>	<p>10</p>	<p>12</p>
<p><b>4</b></p>	<p><b>MOBILE UNIT</b></p> <p><b>4.1</b> Mobile unit- block diagram and working</p> <p><b>4.2</b> Frequency synthesizer- block diagram and working</p> <p><b>4.3</b> Transmitter- block diagram and working</p> <p><b>4.4</b> Receiver- block diagram and working</p> <p><b>4.5</b> SIM type</p> <p><b>4.6</b> SIM card features</p> <p><b>4.7</b> Mobile antennas and its types</p> <p><b>4.8</b> Antenna Specifications in mobile handset(2G)</p>	<p>1. To draw the block diagram of mobile phone</p> <p>2. To demonstrate the specifications of antennas used in mobile handset</p>	<p>12</p>	<p>16</p>

	<b>4.9</b> Logic unit  <b>4.10</b> Control unit- block diagram and working			
<b>5</b>	<b>MODERN CONSUMER PRODUCTS</b>  <b>5.1</b> FAX machine- block diagram and working  <b>5.2</b> Calculators- block diagram and working  <b>5.3</b> Remote controls- block diagram and working  <b>5.4</b> Microwave oven- block diagram and working  <b>5.5</b> Safety Precautions while using microwave  <b>5.6</b> Concept of fuzzy logic  <b>5.7</b> Washing machine- block diagram and working  <b>5.8</b> Video game- block diagram and working  <b>5.9</b> Electronic musical instrument- block diagram and working  <b>5.10</b> Digital Clock - block diagram and working	1. To know the functions of modern consumer products 2. to demonstrate the features of modern consumer products	10	12
<b>6</b>	<b>HEALTHCARE CONSUMER PRODUCTS</b>  <b>6.1</b> Thermometer- block diagram and working  <b>6.2</b> BP monitors- block diagram and working  <b>6.3</b> Electronic weighing machine- block diagram and Working  <b>6.4</b> Pulse rate measurement- block diagram and working  <b>6.5</b> concept of ECG,EEG	1. To describe the working of healthcare consumer products 2. to measure the ECG and EEG signals	10	12



	<b>6.6</b> ECG monitors- block diagram and working  <b>6.7</b> Introduction to telemedicine system  <b>6.8</b> scope, benefits, limitations and applications of Telemedicine  <b>6.9</b> Glucometer- block diagram and working  <b>6.10</b> Applications of telemedicine			
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### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1.	Hi-Fi Audio amplifier and DVD players	12	6	4	6	16
2.	COLOUR TELEVISION	10	4	4	4	12
3.	HDTV AND DTH SYSTEMS	10	3	5	4	12
4.	MOBILE UNIT	12	6	4	6	16
5.	MODERN CONSUMER PRODUCTS	10	3	6	3	12
6.	HEALTHCARE CONSUMER PRODUCTS	10	3	6	3	12
	<b>Total</b>	<b>64</b>	<b>25</b>	<b>29</b>	<b>26</b>	<b>80</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1.	I	Voltage analysis of DVD player	2
2.	I	To study PA system	2
3.	I	Voltage analysis of Hi-Fi amplifier	2
4.	II	To trace different sections of colour television receiver	2

5.	II	Voltage analysis of remote control	2
6.	III	Voltage analysis of DTH system	2
7.	III	Voltage analysis of LED/LCD trainer	2
8.	V	Voltage analysis of microwave oven	2
9.	V	Voltage analysis of washing machine	2
10.	V	Electronic musical instruments.	2
11.	V	Digital clock.	2
12.	V	Fax machine.	2
13.	V	Digital video Game.	2
14.	VI	Voltage analysis of EGC trainer	2
15.	VI	Voltage analysis of BP monitor	2
16.	VI	Voltage analysis of pulse rate measurement	2
17.	VI	Electronic weighing system.	2
18.	VI	Digital Thermometer	2
19.	VI	ECG monitors.	2
20.	VI	Digital Glucose meter.	2
Total			

### SUGGESTED STUDENT ACTIVITIES

1. Find out the technical specifications and the features of various home appliances like washing machine, microwave oven etc. and present a seminar on your search.
2. Write a report on latest consumer products.

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic and magnetic instruments.
2. Arrange a visit to nearby small scale manufacturing unit and make a report of tools and equipments used.
3. Use Flash/Animations to explain the working of different instruments.
4. Give Mini projects to students.

### SUGGESTED LEARNING RESOURCES

#### GGG) Books

Sr. No.	Title of Book	Author	Publication
1	Monochrome & colour Television	R.R. Gulati	New Age International Ltd.

2	Audio & Video Systems	R.G. Gupta	Tata McGraw-Hill
3	Consumer Electronics	S.P.Bali	Pearson Education
4	Consumer Electronics for Engineers	Philip Hoff	Cambridge university press

### HHH) Major Equipment/ Instrument with Broad Specifications

#### III) Software/Learning/ Simulations Websites

1. <http://www.geniusnet.sk/om3bc/datasheets/TDA2052.PDF>
2. <http://www.slideshare.net/PravinShirke07/colour-television>
3. [http://www.ti.com/solution/microwave\\_oven](http://www.ti.com/solution/microwave_oven)
4. [http://www.ti.com/solution/washing\\_machine\\_high\\_end](http://www.ti.com/solution/washing_machine_high_end)
5. [http://www.freescale.com/files/32bit/doc/app\\_note/AN4328.pdf?tid=AMdlDR](http://www.freescale.com/files/32bit/doc/app_note/AN4328.pdf?tid=AMdlDR)
6. <http://www.weather.gov.hk/publica/tnl/tnl025.pdf>

#### Mapping matrix of PO's and CO's:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2	-	-	3	-	3	3	2	3
CO2	2	2	-	-	-	2	3	2	3
CO3	1	2	-	3	-	2	3	1	3
CO4	1	-	-	3	-	3	1	--	3
CO5	2	3	-	3	-	2	3	2	2
CO6	2	3	-	2	-	2	2	--	2

#### 3: High 2: Moderate and 1:Low Relationship

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING****COURSE : CONTROL SYSTEM****COURSE CODE: R18EX4506****COURSE CATEGORY: APPLIED****CREDIT : 5****Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
3	2	3	80	20	--	--	--	100

**Rationale:**

The concept and theory of control systems is needed in almost all electronics engineering fields and in many other engineering and scientific disciplines as well. The main objective of this course is to introduce and give an exposure about the fundamentals of control systems, various components in the control system, time domain, frequency domain analysis and also the system stability analysis.

This course would also provide the basics for controlling the different control actions & to have knowledge of control system, which is beneficial for process control industry which equips the student for maintenance and quality analysis.

**Course Outcomes:**

1. Apply Laplace transform to solve the differential equation for the given control system.
2. Select appropriate controller for the use of processes industries.
3. Understand time domain analysis.
4. Understand frequency domain analysis.
5. Conduct stability analysis using various techniques.
6. Construct components for the servo system.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
1	<b>Basics of Control Systems</b> 1.1 Introduction to linear and non-linear control system. 1.2 Elements of control systems, Open loop and Closed loop control system. 1.3 Effect of Feedback and feed forward control system. 1.4 Comparison: Open loop and Closed loop system, Feedback and feed forward system. <b>Laplace Transform :</b> 1.5 Introduction and Definition of Laplace transform. 1.6 Basic Laplace transform theorems.	1. Understand the basics of Control Systems. 2. Apply Laplace transform in control system.	10	16

	1.7 Inverse Laplace transform. 1.8 Use of Laplace transform in control system.			
<b>2</b>	<b>Controllers:</b> 2.1 Control system Parameters: Error, Set point, Offset, Threshold, Process Dead time, Dead zone. 2.2 On/Off Control Action. 2.3 Continues control actions: P, I, D controllers. 2.4 Composite control actions: PI, PD and PID action. 2.5 Controllers output for different types of Input signals: Step, Ramp, Pulse, Sinusoidal. 2.6 Current to pressure, pressure to current converter. 2.7 Comparison of Hydraulic, pneumatic and electric controllers.	1. Explain Control system Parameters.  2. Interpret functionality of different control system components.	<b>07</b>	<b>12</b>
<b>3</b>	<b>Time Domain Analysis</b> 3.1 Type and Order of the Control Systems. 3.2 Types of Standard Inputs: Step, Ramp and Parabolic input signals. 3.3 Response of First Order System to Step, Ramp and Parabolic Inputs. 3.4 Response of Second Order System to Step Input. 3.5 Time Domain Specifications of Second Order Systems. 3.6 Role of $\xi$ in Second Order System. 3.7 Numericals on Time Domain Specifications.	1. Explain Time Domain Specifications.  2. Determine time response specifications for different control system.	<b>07</b>	<b>12</b>
<b>4</b>	<b>Frequency Domain Analysis</b> 4.1 Need of Frequency Domain Analysis. 4.2 Frequency Domain Specifications. 4.3 Correlation between Time and Frequency Domain. 4.4 Effects of addition of Poles and Zeros. 4.5 Numericals on Frequency Domain Specifications. 4.6 Different techniques used in Frequency Domain analysis. 4.7 Introduction to Gain margin and phase margin.	1. Understand Frequency Domain Specifications.  2. Calculate frequency response specifications for different control system.	<b>07</b>	<b>12</b>
<b>5</b>	<b>Stability</b> 5.1 Introduction of s-plane. 5.2 Stability: Stable, unstable, critically stable and conditionally stable system. 5.3 Routh's stability criterion: Different cases and conditions. 5.4 Stability analysis using Routh's stability criterion. 5.5 General method for Drawing Root Locus. 5.6 Stability analysis using Root Locus. 5.7 Bode plots of Standard Factors. 5.8 Stability analysis using Bode plots.	1. State the stability criterion.  2. Compute stability of a control system using analytical and graphical methods.	<b>10</b>	<b>16</b>
<b>6</b>	<b>Control System Components</b>	1. Explain the major	<b>07</b>	<b>12</b>

6.1 Servo system –definition, block diagram. 6.2 Concept and principle of AC and DC servo systems. 6.3 Comparison of AC and DC servo systems. 6.4 Servo components: i) Potentiometer as error detector. ii) Synchro as error detector. iii) Rotary encoder. iv) Stepper motor. 6.5 Synchro Transmitter. 6.6 Synchro Transmitter – Receiver.	components of Servo system.  2. Compare AC and DC servo system.		
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### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	(A) Basics of Control Systems (B) Laplace Transform	10	6	6	4	16
2	Controllers	07	4	4	4	12
3	Time Domain Analysis	07	3	4	5	12
4	Frequency Domain Analysis	07	3	4	5	12
5	Stability	10	4	6	6	16
6	Control System Components	07	4	4	4	12
	Total	48	24	28	28	80

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS

Sr. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	1	To check the performance of any close loop control system.	2
2	2	Perform the experiment on Electronic PI, PD and PID controller.	2
3	2	Study of Electronic Pneumatic control system.	2
4	2	Perform the experiment on Current to pressure, pressure to current converter.	2
5	3	Perform the experiment on transient response of second order system.	2
6	3	Observe response of type 0, 1 and 2 systems for step, ramp and parabolic inputs.	2
7	3	Assemble and determine time response specifications of first order control system (using passive components)	2
8	5	Determine the stability of a system using Routh Hurwitz Criterion, marginal value of K and frequency of sustained oscillations.	2

9	5	Draw Bode Plot for the given Transfer function. Find PM and GM. Comment on the stability.	2
10	6	To study the Characteristics of synchro as error detector.	2
Total			20×3=60

### SUGGESTED STUDENT ACTIVITIES

1. Identify different examples of control systems used in day-to-day life.
2. Collect the specifications of different control system components.
3. Group discussion on control system stability.

### SPECIAL INSTRUCTIONAL STRATEGIES

1. Arrange a visit to nearby small scale manufacturing unit and make a report of tools and equipments used.
2. Expert lecture from industrial OR academican.
3. Show videos /power point presentation from renowned experts in the area of control System.

### SUGGESTED LEARNING RESOURCES

#### JJJ) Books

Sr. No.	Title of Book	Author	Publication (with year)
1	Process control system	C. D. Johnson	Prentice Hall India
2	Automatic Control Systems	S. Hasan Saeed	Katson educational series
3	Control Systems	Smarajit Ghosh	Pearson
4	Modern Control Engineering	Katsuhiko Ogata	Prentice Hall India
5	Control Systems Engineering	I.Nagrath, M.Gopal	New Age Int.Publishers

#### KKK) Major Equipment/ Instrument with Broad Specifications

1. Digital Storage oscilloscope (100MHz, 2GS/sec)
2. Trainer kit of PID controller. (200°C)
3. Trainer kit of I to P and P to I converter. (4 to 20)mA and (3 to 15)PSI
4. Air compressor. (150 PSI )

#### LLL) Software/Learning/ Simulations Websites

1. [www.nptel.com](http://www.nptel.com)
2. [www.electronics-tutorials.com](http://www.electronics-tutorials.com)
3. <https://lecturenotes.in/subject/52/control-system-engineering-cse>

**Mapping matrix of PO's and CO's:**

<b>Course Outcome</b>	<b>Program Outcome</b>							<b>PSO's</b>	
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>
CO-1	3	2	1	-	-	-	1	2	2
CO-2	2	2	2	3	1	-	1	2	2
CO-3	3	2	1	2	-	-	1	2	1
CO-4	3	2	1	2	-	-	1	2	1
CO-5	2	2	3	3	-	1	2	3	2
CO-6	2	2	2	2	1	-	1	2	2

**3: High 2: Moderate and 1:Low Relationship**



**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : CIRCUIT SIMULATION LAB COURSE CODE: R18EX4507**  
**COURSE CATEGORY : APPLIED CREDIT : 04**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
02	02	-	-	-	@50	-	25	75

**@ Internal Assessment**

**Rationale:**

Electronic circuit simulation uses mathematical models to replicate the behavior of an actual electronic device or circuit. Simulating a circuit's behavior before actually building it greatly improves efficiency and provides insights into the behavior of electronics circuit designs. In particular, for integrated circuits, the tooling (photomasks) is expensive, breadboards are impractical, and probing the behavior of internal signals is extremely difficult. Therefore almost all IC design relies heavily on simulation.

**Course Outcomes:**

1. Demonstrate various electrical signal generations in Multisim environment
2. Develop ability of designing practical electronic circuits through conceptual, analytical, and simulating stages.
3. Analyze an electronic circuit response using simulation.
4. compare calculations, simulations, and measurements of the circuit
5. Design a PCB artwork and layout for given circuit using PCB Software like ULTIBOARD/EAGLE/ExpressPCB/OrCAD

**Course Details:**

UNIT	NAME OF THE TOPIC (with Details)	LEARNING OUTCOME	HOURS	MARKS
1	<b>Introduction to Circuit simulation:</b> Circuit simulation package like EAGLE, Multisim 2011, Electronic workbench or equivalent, <b>Network Analysis:</b> series and parallel resonance circuits, frequency selective network (Twin T or Wein bridge), frequency response of a filters .	1 Use basic laboratory equipment and techniques to measure electrical quantities using virtual laboratory test equipment such as multimeters, power supplies, signal generators, and oscilloscopes 2. Sketch or draw AC electric circuits 3. Analyse these circuits and compute values for currents and voltages..	05	
2	<b>Power Supply simulation:</b> Rectifier Circuits, Power Supplies, IC Voltage Regulators, Switching Regulators.	1. Test power supply circuits, analyze data and compare measured performance to theory and simulation. 2. Interpret and check the load and line regulation of power supply	06	

		3. Measure resistance, DC and AC voltages, current, and power, and experimentally verify the results for a variety of electrical circuits.		
<b>3</b>	<b>Simulation of Small Signal Amplifiers:</b> Bias Circuit, Single Stage CE Amplifier, JFET amplifier Design. Negative Feedback Amplifier	1. Demonstrate basic skills on using simulation programs to describe circuit behavior of small signal amplifiers. 2. Perform Analysis of Amplifiers based on BJTs and FETs using weak signal models. 3. Observe the amplitude and frequency response of amplification circuits	<b>05</b>	
<b>4</b>	<b>Simulation of Large Signal Amplifiers:</b> Class A , Class B, Class AB , Class C Power Amplifiers Complimentary Symmetry Power Amplifiers <b>Simulation of High Frequency Amplifiers:</b> Multivibrators, Single Tuned Amplifiers and Oscillators	1. Design, construct, and take measurement of large signal & high frequency amplifier circuits to compare simulated results with theoretical analysis. 2. Develop the ability to analyze and design analog electronic circuits using discrete components.	<b>06</b>	
<b>5</b>	<b>Simulation of Analog Integrated Circuits:</b> Amplifiers, A/D and D/A Converters, Active Filters: LPF , HPF, BPF and BSF. <b>Simulation of Digital Circuits.</b> Flip-Flops, Counters, Registers etc.	1. Read circuit schematics and construct linear circuits using active and passive components. 2. Predict the behavior and make measurements of simple operational amplifier circuits. 3. Apply simulation tools to describe, analyze, design, and fabricate digital circuits.	<b>05</b>	
<b>6</b>	<b>PCB design:</b> PCB design and Schematic drawing package like NI- UltiBoard /EAGLE/ EXPRESS PCB/ ORCAD/ CADSTAR, or equivalent .	1. Troubleshoot and repair simple electric circuits using simulation technique. 2. Become proficient with computer skills for the analysis and PCB design of circuits. 3. Acquire teamwork skills for working effectively in groups	<b>05</b>	

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
<b>1</b>	<b>Introduction to Circuit simulation:</b>	<b>5</b>				
<b>2</b>	<b>Power Supply simulation:</b>	<b>6</b>				

3	Simulation of Small Signal Amplifiers:	5				
4	Simulation of Large Signal Amplifiers: Simulation of High Frequency Amplifiers:	6				
5	Simulation of Analog Integrated Circuits:	5				
6	PCB design:	5				
	<b>Total</b>	<b>32</b>				

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

#### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	1	Laboratory exercises based on Circuit simulation package like spice, Electronic workbench or equivalent	2
2		Plot resonance curves for series and parallel resonance circuits and find resonance frequency, bandwidth and Q for given values of L, C and R	2
3	2	Design and Simulate Dual Power Supply using LM 78xx and LM 79xx	2
4		Design and Simulation of Switching Regulator Circuits	2
5	3	Design and Simulate Single Stage CE Amplifier	2
6		Design and Simulate Single Stage CS FET Amplifier	2
7	4	Design and Simulate Large Signal (Power) Amplifiers	2
8		Design and Simulate High Frequency Amplifiers	2
9	5	Design and Simulate A/D and D/A conversion Using OP-AMP	2
10		Design and Simulate Active Filters Design Using OP-AMP	2
11		Design and Simulate Ripple Counter	2
12	6	PCB design and Schematic drawing package like NI- UltiBoard, ORCAD, CADSTAR, EAGLE or equivalent (Note: Student may be given exposure to any latest available software tools related to circuit simulation, schematic layout & PCB design.	2
<b>Total</b>			

## SUGGESTED STUDENT ACTIVITIES

- 6.5. Generate and observe basic signals using Multisim
- 6.6. Design analog or digital circuit using simulation software and its PCB layout.

## SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- a. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic circuits .
- b. Arrange a visit to nearby small scale PCB manufacturing unit and make a report of simulators, tools and equipments used.
- c. Use Flash/Animations to explain the working of different PCB simulators.
- d. Give Mini projects to students.

## SUGGESTED LEARNING RESOURCES

### MMM) Books

Sl.No.	Title of Book	Author	Publication (with year)
1	Design of Electronics Circuits And Computer Aided Circuits	M.M. Shah	Wiley Eastern
2	Applications and Design with Analog Integrated Circuits	Michael Jacob	PHI Second Ed.
3	Design with OPAMP And Analog Integrated Circuits	Sergio Franco	TMH Third Ed.
4	Electronics Design	Martin S Roden, Gordon	Shroff Pub.Fourth Ed.
5	PCB Design	Waller C Booshart	Tata M Hill

### NNN) Major Equipment/ Instrument with Broad Specifications

Personal Computers with necessary simulation and design tools

### OOO) Software/Learning/ [Simulations](#) Websites

MultiSim

NI-UltiBoard

[www.linear.com](http://www.linear.com)

[www.expresspcb.com](http://www.expresspcb.com)

### Mapping matrix of PO's and CO's:

Course Outcome	Program Outcome							Program Specific Outcome	
	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PSO 1	PSO2
CO1	2	2	2	3	1	-	1	2	2
CO2	2	3	2	3	1	2	1	2	3
CO3	1	2	3	2	-	2	2	2	2
CO4	2	2	3	2	-	2	2	3	2
CO5	2	1	2	3	2	2	2	2	2

**H: High(3) M: Moderate(2) and L:Low (1) Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : AVIONICS COURSE CODE: R14EX4512**  
**COURSE CATEGORY : APPLIED CREDIT : 04**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
02	02	-	-	-	-	-	50	50

**Rationale:**

This introductory course includes a basic introduction to radio navigation, techniques for installation and repair of air-borne radio communications, troubleshooting and radar equipment systems. This course expands upon introductory avionics, with a focus on aircraft electrical systems and communication systems. Course content includes modules designed to develop students' capacity to perform checks and troubleshoot problems in avionics communication systems, analyze aircraft electrical systems, install avionics systems onto aircraft and calibrate test equipment. Students learn to install, repair and maintain AM and FM transmitters and receivers. FCC rules that pertain to work with AM and FM transmitters are included.

**Course Outcomes:**

1. Apply learning in mathematics, science, and applied sciences to aviation-related disciplines
2. Analyze and interpret aeronautical data;
3. Assess contemporary issues in aviation, and in any related fields of interest;
4. Apply pertinent knowledge in identifying and solving problems;
5. Communicate effectively using both written and oral skills;
6. Assess the national and international aviation environment;

**Course Details:**

UNIT	NAME OF THE TOPIC (with Details)	LEARNING OUTCOME	HOURS	MARKS
1	<b>Introduction to Avionics :</b> 1.1 Avionics Systems Development 1.2 General Principles of Microelectronics Avionics 1.3 Functional structure of LRU 1.4 Integrated Modular Avionics 1.5 Classification of Avionics Systems.	<ul style="list-style-type: none"> <li>• Explain the relationship among major aviation systems;</li> <li>• Describe integrated modular Avionics</li> </ul>	05	
2	<b>Sensors and Lighting:</b>	<ul style="list-style-type: none"> <li>• List and Describe the</li> </ul>	06	

	2.1 Air Data system 2.2 Gyroscope 2.3 Accelerometers 2.4 Inertial Navigation Systems 2.5 Magnetic Sensors 2.6 Outdoor Aircraft Lighting 2.7 Aircraft Interior Lighting	components of airport met instruments system  • Identify various sensors used in Avionics		
<b>3</b>	<b>Communication Systems in Avionics:</b> 3.1 Aviation Communication 3.2 HF, VHF Communication 3.3 Aircraft Communications Addressing and Reporting System 3.4 Satellite communications 3.5 Automatic Dependent Surveillance (ADS-B) 3.6 Intercom Systems 3.7 GSM on Board of Aircraft 3.8 ATC Radar Beacon System	• Describe the structure and performance with regard to communication systems in avionics (internal data buses, global and remote networks, discrete lines, etc). • Understand HF, VHF Communication system • Explain the aviation telecommunication network	<b>05</b>	
<b>4</b>	<b>Avionics Navigation &amp; Surveillance Systems :</b> 4.1 Automatic Directional Finder 4.2 VHF Omni directional Range Equipment 4.3 Distance Measurement Equipment 4.4 Instrument Landing Equipment 4.5 Radio Altimeter 4.6 Weather Radar 4.7 Ground Proximity and Warning System 4.8 Global Navigation Satellite Systems	• Describe conventional radio navigation systems • Understand air traffic management, flight standards, airworthiness provided by regulatory bodies, and accident investigation. • Explain the effect of weather elements on aircraft operation • Describe Global Navigation Satellite System	<b>06</b>	
<b>5</b>	<b>Displays:</b> 5.1 Aircraft Cockpit Instruments 5.2 Electronic Flight Instrument System 5.3 Vision System & Components of Vision system 5.4 ANTONOV/ AIRBUS/ BOEING EFIS Concept 5.5 Head up display	• Identify and list Various instruments used in Aircraft. • Describe the vision system used in Avionics	<b>05</b>	
<b>6</b>	<b>Future Avionics</b> 6.1 Future Tendency of Avionics 6.2 Communication Equipment 6.3 Navigation 6.4 Surveillance 6.5 Aeronautical Information Management 6.6 Concept of Future navigation system	• Explain Performance Based Navigation and Surveillance • Describe Future navigation system	<b>05</b>	

## SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction to Avionics :	5				
2	Sensors and Lighting:	5				
3	Communication Systems in Avionics:	6				
4	Avionics Navigation & Surveillance Systems :	6				
5	Displays:	5				
6	Future Avionics	5				
	<b>Total</b>	<b>32</b>				

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	2	Perform Displacement, velocity and Acceleration Measurement	2
2		Measurement of motion and acceleration by using Gyroscopes.	2
3		Build an Analog Circuit for a Hall-Effect Sensor	2
4		Measurement of light intensity of different light sources	2
5	3	Case study of intercom system	2
6		GSM Trainer	2
7		GPS Trainer	2
8		to determine the speed moving object from different angles and the size of moving object with the Doppler radar.	2
9	4	MIL-Std –1553 Data Buses Configuration with Message transfer.	2
10		MIL-Std –1553 Remote Terminal Configuration.	2
11	5	Measurement of height and level by using Radio Altimeter	2

12	6	Sensors interfacing with data loggers	2
Total			

### SUGGESTED STUDENT ACTIVITIES

1. Visit to identified industry for acquaintance to Avionics System.
2. Learn Problem solving skills.

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of components used in Avionics.
2. Arrange a visit to nearby small scale manufacturing unit/ whether monitoring station and make a report of simulators, tools and equipments used.
3. Use Flash/Animations to explain the working of Avionics System.
4. Give Mini projects to students.

### SUGGESTED LEARNING RESOURCES

#### PPP) Books

Sl. No.	Title of Book	Author	Publication (with year)
1	Principles of Avionics,	Helfrick A,	7th Edition, Avionics Communications, 2012
2	Airport Systems: Planning, Design, and Management	Richard De Neufville.	McGraw-Hill, 2003
3	Avionics made simple	Mouhamed Abdulla, Jaroslav V. Svoboda, Luis Rodrigues	Montreal, Quebec, 2005

### QQQ) Major Equipment/ Instrument with Broad Specifications

### RRR) Software/Learning/ [Simulations](#) Websites

<http://www.avionics.sciary.com/>  
[www.casa.gov.au](http://www.casa.gov.au)

### Mapping matrix of PO's and CO's:

Course Outcome	Program Outcome							Program Specific Outcome	
	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO2
CO1	3	2	2	3	1	-	1	2	-
CO2	1	2	2	3	1	-	1	2	2
CO3	1	2	3	2	2	1	2	3	2
CO4	2	2	2	-	2	1	2	2	2
CO5	2	1	-	1	1	3	2	2	2
CO6	2	-	1	1	2	2	3	2	2

**H: High(3) M: Moderate(2) and L:Low(1) Relationship**



**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**

**COURSE: EMBEDDED SYSTEMS**

**COURSE CODE: R18EX4508**

**COURSE CATEGORY: APPLIED**

**CREDIT: 8**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
4	4	3	80	20	25	-----	25	150

**Rationale:**

Embedded System is exciting and challenging field. To meet the challenges of this growing technology, students should be well conversant with embedded system and real time implementation which provide actual applications of the embedded system.

This course enables students to know the devices, buses & also learn the embedded design of microcontroller. It helps student to get thorough explanation of embedded hardware architecture, interfacing techniques, buses and protocols, hardware and software interrupt, embedded software programming, modeling, inter-process synchronization and real time operating system.

**Course Outcomes:**

1. Describe the major components of embedded systems and System on Chip (SoC).
2. Understand serial and parallel interfaces used in embedded systems.
3. Describe the basic concept of real time operating system and their uses in embedded system.
4. Understand the concept of device driver and ISR.
5. Illustrate ARM 7 Architecture and instruction set for ARM 7.
6. Apply the concept of Internet of Things.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
1	<b>Introduction to Embedded Systems</b> 1.1 Embedded Systems 1.2 Application Areas 1.3 Categories of Embedded Systems 1.4 Specialties of Embedded Systems 1.5 Embedded System Architecture 1.6 Embedded Hardware Units 1.7 Examples of Embedded Systems 1.8 Application Software 1.9 Communication Software 1.10 Embedded System on chip (SOC) SOC –block diagram 1.11 Case Study of digital camera 1.12 Case Study of automatic chock let vending machine	1a. Explain Embedded System and state application areas of embedded systems. 1b. Give classification of Embedded systems. 1c. Draw architecture of Embedded systems. 1d. Draw block diagram of System on Chip. 1e. Write hardware and software components of given embedded system	12	16
2	<b>Communication Interfaces</b> 2.1 Need for Communication Interfaces Serial V/S Parallel Communication, Synchronous V/S Asynchronous Communication 2.2 RS232 2.3 I <sup>2</sup> C, 2.4 CAN 2.5 IrDA 2.6 Bluetooth 2.7 Ethernet 2.8 USB 2.9 IEEE 1394 2.10 PCI,PCI-X Bus	2a. Explain Serial, Parallel communication. 2b. Describe various protocols with suitable diagram 2c. State various applications of communication protocols. 2d. Draw the frame formats of given protocol.	10	12
3	<b>Embedded /RTOS concepts</b> 3.1 Architecture of Kernel 3.2 Interprocess Communication 3.3 Task and Task scheduler 3.4 Semaphore 3.5 Mutex 3.6 Mailbox 3.7 Message Queue 3.8 Event Register 3.9 Pipes 3.10 Specification of RTOS in Embedded systems 3.11 Starvation 3.12 Deadlock	3a. Draw architecture of Kernel. 3b. Explain Inter-process communications. 3c. Describe various IPC functions. 3d. Give specifications of RTOS. 3e. Explain Starvation and deadlock.	10	12

<b>4</b>	<b>Device Driver and Interrupt Service Mechanism</b> 4.1 Device Driver concept 4.2 ISR concept 4.3 Interrupt sources 4.4 Interrupts handling Mechanism 4.5 Context-context switching 4.6 Interrupt Latency and Deadline 4.7 Direct Memory Access	4a. Explain device driver concept. 4b. Describe interrupts handling mechanism. 4c. Explain context switching. 4d. Draw and explain Direct Memory Access	<b>10</b>	<b>12</b>
<b>5</b>	<b>ARM 7 Architecture</b> 5.1 Architecture: ARM 7 Architecture Introduction ARM7TDMI core, Block diagram, functional diagram. 5.2 Programmers model. 5.3 Various operating modes of ARM7. 5.4 Instruction set: Data processing instructions, Arithmetic and Logical instruction, Branching, Load and Store.	5a. Draw architecture, block diagram, functional diagram of ARM 7TDMI and explain it. 5b. Explain programmer's model and operating modes of ARM7. 5c. State the different group of instructions of ARM 7.	<b>12</b>	<b>16</b>
<b>6</b>	<b>Internet of Things</b> 6.1 Internet of Things 6.2 Introduction to Raspberry Pi 6.3 Python programming for Raspberry Pi 6.4 Getting Familiar with the GPIO Pins of your Pi 6.5 Sensor Interfacing	6a. Explain concept IOT 6b. Identify various blocks of Raspberry Pi board. 6c. Understand Python programming for Raspberry Pi 6d. Interface various sensors to Raspberry Pi	<b>10</b>	<b>12</b>

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
<b>1</b>	<b>Introduction to Embedded Systems</b>	<b>12</b>	<b>8</b>	<b>4</b>	<b>4</b>	<b>16</b>
<b>2</b>	<b>Communication Interfaces</b>	<b>10</b>	<b>2</b>	<b>6</b>	<b>4</b>	<b>12</b>
<b>3</b>	<b>Embedded /RTOS concepts</b>	<b>10</b>	<b>4</b>	<b>8</b>	<b>--</b>	<b>12</b>
<b>4</b>	<b>Device Driver and Interrupt Service Mechanism</b>	<b>10</b>	<b>4</b>	<b>8</b>	<b>--</b>	<b>12</b>
<b>5</b>	<b>ARM 7 Architecture</b>	<b>12</b>	<b>4</b>	<b>4</b>	<b>8</b>	<b>16</b>
<b>6</b>	<b>Internet of Things</b>	<b>10</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>12</b>
	<b>Total</b>	<b>64</b>	<b>26</b>	<b>34</b>	<b>20</b>	<b>80</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### **SUGGESTED EXERCISES/PRACTICALS (Any Sixteen Practicals)**

<b>S. No.</b>	<b>Unit No.</b>	<b>Practical Exercises</b> (Outcomes' in Psychomotor Domain)	<b>Appro. Hrs. Required</b>
<b>1</b>	<b>1</b>	Identify different sections of PSoC Development Board.	2
<b>2</b>	<b>1</b>	Develop and execute C language program for 8 bit & 16 bit numbers using PSoC Development Board.	2
<b>3</b>	<b>2</b>	Develop and execute C language program for arithmetic and logical operations.	2
<b>4</b>	<b>2</b>	Develop and execute C language program to generate square wave on port of 8051.	2
<b>5</b>	<b>2</b>	Develop and execute C language program to blink a LED connected on port pin.	2
<b>6</b>	<b>2</b>	Develop and execute C language program for serial port communication to transfer CWIT on HyperTerminal	2
<b>7</b>	<b>2</b>	Develop and execute C language program for stepper motor and Interface stepper motor to microcontroller board.	2
<b>8</b>	<b>2</b>	Develop and execute C language program for servo motor and Interface servo motor to microcontroller board.	2
<b>9</b>	<b>2</b>	Develop and execute C language program for dc motor and Interface dc motor to microcontroller board.	2
<b>10</b>	<b>2</b>	Develop and execute C language program for GSM module interfacing.	2
<b>11</b>	<b>5</b>	Develop and execute Assembly language program of 16/32 bit addition for ARM7.	2
<b>12</b>	<b>5</b>	Develop and execute Assembly language program of 16/32 bit subtraction for ARM7.	2
<b>13</b>	<b>5</b>	Develop and execute Assembly language program of 32 bit Multiplication for ARM7.	2
<b>14</b>	<b>5</b>	Develop and execute Assembly language program to find 1's complement of a number for ARM7.	2
<b>15</b>	<b>6</b>	Interfacing of LED to Raspberry Pi	2
<b>16</b>	<b>6</b>	Interfacing of Switch to Raspberry Pi	2
<b>17</b>	<b>6</b>	Interfacing of DC motor to Raspberry Pi	2
<b>18</b>	<b>6</b>	Interfacing of LCD to Raspberry Pi	2
<b>19</b>	<b>6</b>	Interfacing of IR sensor to Raspberry Pi	2
<b>20</b>	<b>6</b>	Interfacing of Ultrasonic sensor g to Raspberry Pi	2
<b>Total</b>			<b>32/40</b>

## SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like -

1. Market Survey of Embedded system –Digital camera and Cell Phone
2. Prepare chart showing all instructions of ARM7.
3. Case Study based on embedded applications.
4. Prepare IOT model for smart city applications.

## SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Arrange a visit to any embedded system industry and make a report.
2. Use Flash/Animations to explain case study of embedded system.
3. Arrange expert lecture of any industry person or any Academics person in the area of Device Drivers, RTOS, ARM and Embedded design.

## SUGGESTED LEARNING RESOURCES

### SSS) Books

Sr. No.	Title of Book	Author	Publication (with year)
1	Embedded / Real-Time Systems	Dr. K.V.K.K. Prasad	Dreamtech press
2	Embedded Systems-Architecture, Programming and Design	Raj Kamal	Tata McGraw-Hill Publishing Company Limited
3	ARM System Developer's Guide	Sloss	Esleiver 2004 ISBN-1558608745
4	Arm System-On-Chip Architecture	Steve Furber	Pearson 2009 ISBN-978831708408
5	ARM Architecture Reference Manual	Jaggar, Dave	Prentice Hall. 1996 pp. 6– ISBN 978-0-13-736299-8
6	Embedded System Design	Frank Vahid/Tony Givargis	Wiley India Education
7	Embedded Systems-Architecture, Programming and Design	Raj Kamal	Tata McGraw-Hill Publishing Company Limited
8	Internet of Things-A hands on approach	Arshdeep Bahga and Vijay Madiseti	VPT; 1 edition (August 9, 2014)

### TTT) Major Equipment/ Instrument with Broad Specifications

1. 8051 Microcontroller Trainer Kit.
2. ARM7 development board.
3. Raspberry Pi development board.
4. 8051 Simulator Software (Web version)
5. Computer system (Latest version)
6. Peripheral interface kits

**UUU) Software/Learning/ [Simulations](#) Websites**

1. [www.arm.com](http://www.arm.com)
2. [www.Keil.com](http://www.Keil.com)
3. [www.infocenter.arm.com](http://www.infocenter.arm.com)
4. [www.embedded.com](http://www.embedded.com).

**Mapping matrix of CO's –PO's and PSO's:-**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO-1	1	-	2	3	1	1	2	3	3
CO-2	1	2	2	3	-	1	2	3	3
CO-3	1	-	-	-	-	-	2	1	1
CO-4	1	-	-	-	1	1	2	1	1
CO-5	1	3	3	3	1	2	2	3	3
CO-6	1	3	3	3	1	2	2	3	3

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**

**COURSE : MINI PROJECT AND SEMINAR COURSE CODE: R18 EX4509**

**COURSE CATEGORY : Applied CREDIT : 02**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
-	02	-	-	-		@ 50	50	100

**@ Internal Assessment**

**Rationale:**

Diploma project work is very demanding of students, many students find the transition from traditional practical work difficult. In particular, they have unrealistic expectations of what can be achieved. In order to prepare students for their project work, some pre final -year courses include mini-projects. This course of one such mini-project: it was effective in preparing students for their project work but most students were unaware of this and as a result, many felt demoralized by their experience. A number of factors which might improve the effectiveness of mini-projects and reduce the students' negative feelings were identified including: making the aims and objectives unambiguous, achievable and explicit; recognizing the nature and difficulty of the demands which are being made of students; and providing sufficient time, support and guidance for students.

**Course Outcomes: CO's**

1. Understand, plan and execute a Mini Project with team.
2. Implement electronic hardware by learning PCB artwork design, soldering techniques, trouble-shooting etc.
3. Prepare a technical report based on the Mini project.
4. Deliver technical seminar based on the Mini Project work carried out.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME (After the end of the topic , the student will able to )	HOURS	MARKS
1.	Formation of groups, Finalization of Mini project & Distribution of work.	1 work in team 2 Finalise the specifications of project	Week 1 , 2 &3	10
2.	PCB artwork design using an appropriate EDA tool, Simulation.	1 Select appropriate EDA tool for simulation of circuit and PCB design	Week 4,5 & 6	10

		2 Demonstrate the artwork of the PCB		
3.	Hardware assembly, Testing	1 Build the hardware for project 2 Examine the hardware and troubleshooting	Week 7,8 & 9	6
4.	Enclosure Design, Fabrication etc	1 Design the appropriate enclosure	Week 10 & 11	4
5.	Preparation, Checking & Correcting of the Draft Copy of Report	1 Compose the Draft copy of project report 2 Generate final copy of project report	Week 12,13 & 14	8
6.	Demo and Group presentations	1 outline of project report 2 Explain the final outcomes to course experts	Week 15 & 16	12

**SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)**

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Formation of groups, Finalization of Mini project & Distribution of work.	6	10	-	-	10
2	PCB artwork design using an appropriate EDA tool, Simulation.	6		5	5	10
3	Hardware assembly, Testing	6	2	2	2	6
4	Enclosure Design, Fabrication etc	4		2	2	4
5	Preparation, Checking & Correcting of the Draft Copy of Report	6	2	4	2	8
6	Demo and Group presentations	4	5	5	2	12
	<b>Total</b>	<b>32</b>	<b>19</b>	<b>18</b>	<b>13</b>	<b>50</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.



## SUGGESTED EXERCISES/PRACTICALS/TOPICS

Domains for projects may be from the following, but not limited to:

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	-	Instrumentation and Control Systems	-
2	-	Electronic Communication Systems	-
3	-	Biomedical Electronics	-
4	-	Power Electronics	-
5	-	Audio , Video Systems	-
6	-	Embedded Systems	-
7	-	Mechatronic Systems	-
Total			-

## SUGGESTED STUDENT ACTIVITIES

### Guidelines:

1. Project group shall consist of not more than 3 students per group.
2. Suggested Plan for various activities to be monitored by the teacher.
3. A project report with following contents shall be prepared:
  - a. Title of project
  - b. Specifications of project
  - c. Block diagram
  - d. Circuit diagram
  - e. Selection of components
  - f. Simulation results
  - g. PCB artwork
  - h. Layout versus schematic verification report
  - i. Testing procedures
  - j. Enclosure design
  - k. Test results
  - l. Conclusion

## SPECIAL INSTRUCTIONAL STRATEGIES (if any)

- Hardware component is mandatory.
- Layout versus schematic verification is mandatory.

## SUGGESTED LEARNING RESOURCES

### VVV) Books

Sr. No.	Title of Book	Author	Publication (with year)
1	Effective Technical Communication	M Ashraf Rizvi	Tata McGraw Hill Education Pvt. Ltd
2	Communication Skills for Engineers	C Muralikrishna, Sunita Mishra	Pearson
3	Technical Communication, Principles and Practice	Meenakshi Raman, Sangeeta Sharma	Oxford University Press

### A. Major Equipment/ Instrument with Broad Specifications

Available in Laboratory

### WWW) Software/Learning/ [Simulations](#) Websites

1. Any open source PCB design and simulation software e.g. eagle, Tiny Cad, Orcad , electronic work bench etc.
2. Use of Search engine as ‘ electronic project ideas’
3. Project designs ideas can be necessarily adapted from recent issues of electronic design magazines  
Application notes from well known component manufacturers may also be referred.

### Mapping matrix of PO's and CO's:

Course Outcome	Program Outcomes							PSO's	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	3	3	3	2	3	3	3	3
CO2	3	3	3	3	3	3	2	3	3
CO3	3	-	-	2	2	2	3	2	2
CO4	3	2	-	2	3	3	3	1	1

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION  
ENGINEERING**

**COURSE : MAIN PROJECT**

**COURSE CODE: R18 EX4510**

**COURSE CATEGORY : Applied**

**CREDIT : 04**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
-	04	-	-	-		50	100	150

**Rationale:**

Diploma final project work is very important for students technical growth, many students find the transition from small mini projects to moderate electronic systems. In order to prepare students for their project work, some pre final -year courses include mini-projects. This course transfers the students idea into hand's on experience of working models. Also they are prepared for standard documentation methods, ethics, benefits for society. The students undergo in various stages of system development such as need for society for easy livings, self confidence, fault findings and implementation on site.

**Course Outcomes: CO's**

1. Generation of idea as per society need.
2. Implement electronic hardware by learning PCB artwork design, soldering techniques, trouble-shooting etc.
3. Prepare a technical report based on the final project.
4. Deliver technical seminar based on the final Project work carried out.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME (After the end of the topic , the student will able to )	HOURS	MARKS
1.	Formation of groups, Finalization of project & Distribution of work.	1. Work in team  2. Finalize the specifications of project	Week 1 , 2 &3	10
2.	PCB artwork design using an appropriate EDA tool,	1. Select appropriate EDA tool for	Week 4,5 & 6	10

	Simulation.	simulation of circuit and PCB design 2. Demonstrate the artwork of the PCB		
3.	Hardware assembly, Testing	1. Build the hardware for project 2. Examine the hardware and troubleshooting	Week 7,8 & 9	6
4.	Enclosure Design, Fabrication etc	1. Design the appropriate enclosure	Week 10 & 11	4
5.	Preparation, Checking & Correcting of the Draft Copy of Report	1. Compose the Draft copy of project report 2. Generate final copy of project report	Week 12,13 & 14	8
6.	Demo and Group presentations	1. Outline of project report 2. Explain the final outcomes to course experts	Week 15 & 16	12

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Formation of groups, Finalization of Mini project & Distribution of work.	6	10	-	-	10
2	PCB artwork design using an appropriate EDA tool, Simulation.	6		5	5	10
3	Hardware assembly, Testing	6	2	2	2	6
4	Enclosure Design, Fabrication etc	4		2	2	4

5	Preparation, Checking & Correcting of the Draft Copy of Report	6	2	4	2	8
6	Demo and Group presentations	4	5	5	2	12
	<b>Total</b>	<b>32</b>	19	18	13	<b>50</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS/TOPICS

Domains for projects may be from the following, but not limited to:

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
1	-	Instrumentation and Control Systems	-
2	-	Electronic Communication Systems	-
3	-	Biomedical Electronics	-
4	-	Power Electronics	-
5	-	Audio , Video Systems	-
6	-	Embedded Systems	-
7	-	Mechatronics Systems	-
<b>Total</b>			-

### SUGGESTED STUDENT ACTIVITIES

#### Guidelines:

1. Project group shall consist of not more than 3 students per group.
2. Suggested Plan for various activities to be monitored by the teacher.
3. A project report with following contents shall be prepared:
  - a) Title of project
  - b) Specifications of project
  - c) Block diagram
  - d) Circuit diagram
  - e) Selection of components
  - f) Simulation results
  - g) PCB artwork

- h) Layout versus schematic verification report
- i) Testing procedures
- j) Enclosure design
- k) Test results
- l) Conclusion

### **SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

- Hardware component is mandatory.
- Layout versus schematic verification is mandatory.

### **SUGGESTED LEARNING RESOURCES**

#### **XXX) Books**

<b>Sr. No.</b>	<b>Title of Book</b>	<b>Author</b>	<b>Publication (with year)</b>
<b>1</b>	Effective Technical Communication	M Ashraf Rizvi	Tata McGraw Hill Education Pvt. Ltd
<b>2</b>	Communication Skills for Engineers	C Muralikrishna, Sunita Mishra	Pearson
<b>3</b>	Technical Communication, Principles and Practice	Meenakshi Raman, Sangeeta Sharma	Oxford University Press

#### **A. Major Equipment/ Instrument with Broad Specifications**

Available in Laboratory

#### **YYY) Software/Learning/ [Simulations](#) Websites**

- Any open source PCB design and simulation software e.g. eagle, Tiny Cad, Orcad , electronic work bench etc.
- Use of Search engine as ‘ electronic project ideas’
- Project designs ideas can be necessarily adapted from recent issues of electronic design magazines  
Application notes from well known component manufacturers may also be referred.

#### **Mapping matrix of PO's and CO's:**

<b>Course Outcome</b>	<b>Program Outcomes</b>							<b>PSO's</b>	
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>	3	3	3	1	3	2	3	3	3
<b>CO2</b>	3	3	3	3	3	3	2	3	3
<b>CO3</b>	3	-	-	2	2	2	3	2	2
<b>CO4</b>	3	2	-	2	3	3	3	1	1

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION  
ENGINEERING**

**COURSE : INDUSTRIAL TRAINING**

**COURSE CODE: R18 EX4511**

**COURSE CATEGORY : Applied**

**CREDIT : 6^**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
-	-	-	-	-	-	75	75	150







**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : OPTICAL AND MICROWAVE COMMUNICATION COURSE CODE:R18EX5501**

**COURSE CATEGORY : SPECIALISED CREDIT : 05**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
03	02	3	80	20	50	--	50	200

**Rationale:**

Modern high capacity telecommunication networks based on optical fiber technology have become an integral and indispensable part of society. Applications for these sophisticated networks range from simple web browsing and e-mail exchanges to critical healthcare diagnosis and complex business transactions. Due to importance of these networks to everyday life, users have come to expect the communication services to always be available and to function properly.

The students who are preparing themselves for electronics or communication industries need to understand theoretical, experimental analysis based on satellite, microwave and fiber optics technology. This subject familiarizes students with ray theory, optical couplers, losses, optical networks, microwave devices.

**Course Outcomes:**

1. Estimate optical parameters for fiber optic link.
2. Categorize signal degradation due to various losses.
3. Select the appropriate opto-coupler pair for intended application.
4. Evaluate performance parameters of microwave components based on applications.
5. Carry out link calculations of satellite link.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOMES	HOURS	MARKS
01	<b>Optical fiber structures</b> <b>1.1</b> Optical communication systems block diagram and working <b>1.2</b> Advantages of Optical Communication <b>1.3</b> Types of fiber optic cables, their construction	1a. Explain the process of light propagation through optical fiber  1b. Compare various optical fibers.  1c. Determine optical parameters for given optical	07	12

	<p><b>1.4</b> Comparison between all types of optical cables</p> <p><b>1.5</b> Light propagation in fiber Optic cable</p> <p><b>1.6</b> Snell's law, critical angle, acceptance angle,</p> <p><b>1.7</b> numerical aperture</p> <p><b>1.8</b> Numerical based on ray theory</p>	fiber.		
<b>02</b>	<p><b>Signal degradation in optical fibers</b></p> <p><b>2.1</b> Attenuation</p> <p><b>2.2</b> Absorption due to atomic defects</p> <p><b>2.3</b> Extrinsic and intrinsic absorption</p> <p><b>2.4</b> linear scattering losses- linear Rayleigh scattering, Mie scattering</p> <p><b>2.5</b> Nonlinear scattering losses- Raman, Brillouin</p> <p><b>2.6</b> Macro bending and micro bending losses</p> <p><b>2.7</b> Intermodal and Intramodal dispersion</p>	<p>2a. Explain various types of losses present in the optical fiber.</p> <p>2b. Evaluate attenuation in the given optical fiber.</p>	<b>07</b>	<b>12</b>
<b>03</b>	<p><b>Optical sources and detectors</b></p> <p><b>3.1</b> Optical sources-LED-edge emitter LED, surface emitter LED-construction, principle of working</p> <p><b>3.2</b> LASER-injection laser– construction working principle(Basic concept, absorption and emission of radiation, population inversion)</p> <p><b>3.3</b> PIN photodiode – construction, working and characteristics</p> <p><b>3.4</b> Avalanche photodiode – construction, working</p> <p><b>3.5</b> Optical fiber system link</p>	<p>3a. Explain various optical sources and detectors</p> <p>3b. Carry out power budget for optical link.</p> <p>3c. Explain optical network topologies and the concept of WDM</p>	<b>10</b>	<b>16</b>

	<p>budget</p> <p><b>3.6</b> Rise time budget.</p> <p><b>3.7</b> Numerical based on power budget</p> <p><b>3.8</b> Optical network categories and topologies</p> <p><b>3.9</b> Operational principal of WDM</p>			
<b>04</b>	<p><b>Waveguides and Tee Junctions</b></p> <p><b>4.1</b> Rectangular wave guide</p> <p><b>4.2</b> Propagation of waves through rectangular waveguides, various modes</p> <p><b>4.3</b> Cut-off frequency, group velocity</p> <p><b>4.4</b> phase velocity, guide wavelength</p> <p><b>4.5</b> numerical based on rectangular waveguide</p> <p><b>4.6</b> E plane tee, H plane tee - construction and working</p> <p><b>4.7</b> Magic tee- construction and working</p>	<p>4a. Evaluate different parameters of rectangular waveguide.</p> <p>4b. Explain microwave tee junctions.</p>	<b>07</b>	<b>12</b>
<b>05</b>	<p><b>Microwave components</b></p> <p><b>5.1</b> Two cavity klystron - Construction, characteristics along with working</p> <p><b>5.2</b> multi cavity klystron – Construction and working</p> <p><b>5.3</b> Reflex klystron- Construction, characteristics along with working</p> <p><b>5.4</b> Magnetron- Construction, characteristics along with working</p> <p><b>5.5</b> Gunn diode - Construction, characteristics along with working</p> <p><b>5.6</b> parametric amplifier- Construction, characteristics along</p>	<p>5a. Explain various microwave amplifiers and oscillators.</p> <p>5b. Explain isolator and circulator.</p> <p>5c. State the applications of isolator and circulator.</p>	<b>10</b>	<b>16</b>

	with working <b>5.7</b> Directional coupler <b>5.8</b> Isolator- construction, working <b>5.9</b> Circulator- construction, working <b>5.10</b> Applications of isolator and circulator			
<b>06</b>	<b>Satellite Communication</b> <b>6.1</b> satellite orbits-GEO, LEO,MEO,HEO <b>6.2</b> Inclined elliptical and polar circular orbits <b>6.3</b> satellite frequencies <b>6.4</b> satellite attitude, control systems and Station keeping <b>6.5</b> Link calculations <b>6.6</b> factors affecting satellite communication <b>6.7</b> Satellite applications	6a. Compare different satellite orbits. 6b. Determine satellite link parameters. 6c. Explain need of station keeping. 6d. Describe applications of satellite communication.	<b>07</b>	<b>12</b>

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
<b>1</b>	<b>Optical fiber structures</b>	<b>07</b>	<b>02</b>	<b>06</b>	<b>04</b>	<b>12</b>
<b>2</b>	<b>Signal degradation in optical fibers</b>	<b>07</b>	<b>04</b>	<b>06</b>	<b>02</b>	<b>12</b>
<b>3</b>	<b>Optical sources and detectors</b>	<b>10</b>	<b>02</b>	<b>08</b>	<b>06</b>	<b>16</b>
<b>4</b>	<b>Waveguides and Tee Junctions</b>	<b>07</b>	<b>02</b>	<b>04</b>	<b>06</b>	<b>12</b>
<b>5</b>	<b>Microwave components</b>	<b>10</b>	<b>04</b>	<b>12</b>	<b>00</b>	<b>16</b>
<b>6</b>	<b>Satellite Communication</b>	<b>07</b>	<b>02</b>	<b>06</b>	<b>04</b>	<b>12</b>
<b>Total</b>		<b>48</b>	<b>16</b>	<b>42</b>	<b>22</b>	<b>80</b>

**SUGGESTED EXERCISES/PRACTICALS (any 8)**

<b>S. No.</b>	<b>Unit No.</b>	<b>Practical Exercises (Outcomes' in Psychomotor Domain)</b>	<b>Appro. Hrs. Required</b>
1	1	Measurement of NA of optical fiber cable	02
2	1	To plot radiation pattern of LED	02
3	2	To measure the effects of bending losses of optical fiber	02
4	3	To plot characteristics of optical source.	02
5	3	Design of analog link and digital link using fiber optic cable	02
6	4	Verification of port characteristics of E-plane, H-plane and magic Tee junctions	02
7	5	Verification of port characteristics of circulator	02
8	5	Verification of port characteristics of Isolator	02
9	5	To calculate coupling factor of MHD coupler	02
10	6	Determine propagation delay of satellite link.	02
Total			20

**SUGGESTED STUDENT ACTIVITIES**

1. Download the information about different applications of fiber optic system.
2. Collect the information about different applications of microwave devices.

**SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

- i. Arrange a visit to any nearby industry.
- ii. Show video/animation film to demonstrate the working principles, constructional features of different types of microwave devices.

**SUGGESTED LEARNING RESOURCES****ZZZ) Books**

<b>Sr. No.</b>	<b>Title of Book</b>	<b>Author</b>	<b>Publication</b>
1	Optical Fiber Communication Principles	John M. Senior	PHI
2	Optical Fiber Communications	Gerd Keiser	The MCGraw-Hill
3	Microwave & Radar Engineering	M. Kulkarni	Umesh

4	Satellite communication	Pratt	PHI
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**AAAA) Major Equipment/ Instrument with Broad Specifications**

1. Fiber optic analog and digital link trainer
2. Microwave bench(X band)
3. Digital storage oscilloscope (100MHz, 2Gsamples/sec)
4. Matlab/ Scilab software for simulation.

**BBBB) Software/Learning/ Simulations Websites**

1. [www.nptel.com](http://www.nptel.com)
2. [http://course.ee.ust.hk/elec342/notes/lecture2\\_ray%20theory%20transmission.pdf](http://course.ee.ust.hk/elec342/notes/lecture2_ray%20theory%20transmission.pdf)
3. <http://www.icnirp.de/documents/Led.pdf>
4. <http://stanwir.seecs.nust.edu.pk/Lectures/FOCS/LED.pdf>
5. [http://course.ee.ust.hk/elec342/notes/Lecture%2013\\_laser%20diodes%282%29.pdf](http://course.ee.ust.hk/elec342/notes/Lecture%2013_laser%20diodes%282%29.pdf)
6. <http://opti500.cian-erc.org/opti500/pdf/Lecture%2024%20Bend%20Loss,%20>

**CCCC) Mapping matrix of PO's and CO's:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO-1	2	3	-	3	-	2	3	3	3
CO-2	2	2	-	2	-	2	2	3	2
CO-3	2	2	1	3	-	2	3	3	2
CO-4	2	3	-	3	2	3	3	3	2
CO-5	2	3	3	3	-	2	3	3	3

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE: SATELLITE & RADAR COMMUNICATION** **COURSE CODE: R18EX5502**  
**COURSE CATEGORY : SPECIALISED CREDIT : 05**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
03	02	3	80	20	50	--	50	200

**Rationale:**

The use of satellites in communication systems is very much a fact of everyday life as is evidenced by many homes equipped with antennas used for satellite TV& telephones. This subject provides a brief coverage of fundamentals of satellite & Radar communication.

**Course Outcomes:**

1. Determine orbital parameters for satellite communication.
2. Illustrate satellite communication system
3. Estimate Radar range parameters
4. Categorize various RADAR systems.
5. Compare various scanning method and display methods used in radar communication.

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOMES	HOURS	MARKS
01	<b>Fundamentals Of Satellite communication</b>  1.1 Classification of satellite- synchronous, asynchronous, active and passive(only concept)  1.2 Satellite orbit(GEO,MEO, LEO,HEO)  1.3 Terms related to satellite communication- apogee, perigee, major axis, minor axis  1.4 concept of footprint, satellite beams  1.5 concept of station keeping	<b>1a.</b> Compare various satellite orbits.  <b>1b.</b> State terms related to satellite communication  <b>1c.</b> Determine orbital parameters based on kepler's laws.	10	16



	<p><b>1.6</b> Satellite frequencies, frequency reuse</p> <p><b>1.7</b> Kepler's laws of orbital motion</p> <p><b>1.8</b> orbital calculations</p> <p><b>1.9</b> Numerical based on orbital calculations</p> <p><b>1.10</b> satellite communication applications</p>			
<b>02</b>	<p><b>Satellite angles and control</b></p> <p><b>2.1</b> Satellite speed and period, Look angle, azimuth angle, angle of elevation, angle of inclination</p> <p><b>2.2</b> Satellite communication system- Transponder, repeaters(uplink model)</p> <p><b>2.3</b> Satellite communication system- Transponder, repeaters(downlink model)</p> <p><b>2.4</b> Communication satellite-block diagram and working</p> <p><b>2.5</b> Satellite subsystem Communication Subsystems- block diagram and working</p> <p><b>2.6</b> Power subsystem- block diagram and working</p> <p><b>2.7</b> Telemetry command and control subsystem</p>	<p><b>2a.</b> Explain uplink and downlink model for satellite communication</p> <p><b>2b.</b> Understand various subsystems in satellite communication.</p>	<b>07</b>	<b>12</b>
<b>03</b>	<p><b>Satellite subsystems</b></p> <p><b>3.1</b> Satellite ground station-block diagram and working</p> <p><b>3.2</b> Antenna subsystem</p> <p><b>3.3</b> Receive subsystem</p> <p><b>3.4</b> Transmitter subsystem</p> <p><b>3.5</b> Main and auxiliary propulsion</p>	<p><b>3a.</b> Elaborate various satellite subsystems in detail.</p> <p><b>3b.</b> Explain the concept of satellite television</p>	<b>07</b>	<b>12</b>

	<p>subsystem</p> <p><b>3.6</b> communication channel subsystem</p> <p><b>3.7</b> satellite television- block diagram and working</p>			
<b>04</b>	<p><b>Fundamentals Of Radar</b></p> <p><b>4.1</b> Simple radar system- block diagram and working</p> <p><b>4.2</b> Terms related to radar-PRF,MUR, duty cycle, duplexer</p> <p><b>4.3</b> Classification of radar-CW, pulse radar</p> <p><b>4.4</b> pulse radar- block diagram and working</p> <p><b>4.5</b> Frequencies and power used in radar</p> <p><b>4.6</b> Radar range equation-derivation</p> <p><b>4.7</b> factors influencing maximum range</p> <p><b>4.8</b> numerical</p> <p><b>4.9</b> significance of duplexer in radar</p> <p><b>4.10</b> Radar receivers- general principals</p>	<p><b>4a.</b> Compare CW and pulse RADAR systems.</p> <p><b>4b.</b> Illustrate the concept of RADAR receiver</p> <p><b>4c.</b> Carry out the radar range equations</p>	<b>10</b>	<b>16</b>
<b>05</b>	<p><b>MTI And CW Radar</b></p> <p>5.1 Doppler effect</p> <p>5.2 MTI radar block diagram, working and applications</p> <p>5.3 concept and applications of analog and digital MTI radar</p> <p>5.4 blind speed</p> <p>5.5 radar becons-concept and applications</p> <p>5.6 CW Doppler radar- block diagram, working</p>	<p><b>5a.</b> Explain MTI and CW Doppler Radar</p> <p><b>5b.</b> Understand the concept of radar beacons</p>	<b>07</b>	<b>12</b>

	5.7 applications of CW Doppler radar			
<b>06</b>	<b>Displays And Antenna Tracking</b>  6.1 antenna scanning- horizontal scan pattern, vertical scan pattern, helical scan pattern, spiral scan pattern  6.2 comparison of various scanning patterns  6.3 antenna tracking-lobe switching, conical switching, mono-pulse switching  6.4 tracking in range, tracking in Doppler  6.5 concept of display methods-A-scope, plan position indicator, automatic target detection  6.6 limitations and advantages of various display methods  6.7 applications of various display methods	<b>6a.</b> Distinguish various scanning methods  <b>6b.</b> Explain the concept of antenna tracking methods  <b>6c.</b> Elaborate applications of display methods	<b>07</b>	<b>12</b>

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
<b>1</b>	<b>Fundamentals Of Satellite communication</b>	<b>10</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>16</b>
<b>2</b>	<b>Satellite angles and control</b>	<b>07</b>	<b>4</b>	<b>6</b>	<b>2</b>	<b>12</b>
<b>3</b>	<b>Satellite subsystems</b>	<b>07</b>	<b>4</b>	<b>6</b>	<b>2</b>	<b>12</b>
<b>4</b>	<b>Fundamentals Of Radar</b>	<b>10</b>	<b>6</b>	<b>6</b>	<b>4</b>	<b>16</b>
<b>5</b>	<b>MTI And CW Radar</b>	<b>07</b>	<b>2</b>	<b>8</b>	<b>2</b>	<b>12</b>
<b>6</b>	<b>Displays And Antenna Tracking</b>	<b>07</b>	<b>2</b>	<b>6</b>	<b>4</b>	<b>12</b>
<b>Total</b>		<b>48</b>	<b>22</b>	<b>40</b>	<b>18</b>	<b>80</b>

**SUGGESTED EXERCISES/PRACTICALS (any 8)**

<b>Sr. No.</b>	<b>Unit No.</b>	<b>Practical Exercises (Outcomes in Psychomotor Domain)</b>	<b>Approx. Hrs. Required</b>
1	2 & 3	To study uplink transmitter and down link receiver and transponder	02
2	1,2 & 3	To establish a direct communication link between Uplink transmitter and Downlink receiver using tone signal	02
3	3	To setup an Active satellite link and demonstrate link fail operation	02
4	2	To establish an AUDIO-VIDEO satellite link between Transmitter and Receiver	02
5	2	To transmit and receive function generator waveforms through satellite link	02
6	3	Study the delay between Uplink transmitter and Downlink receiver during data transmission	02
7	4	Study of pulse radar system	02
8	5	Study of understand the principle of Doppler Radar of Time and Frequency measurement with the help of a moving pendulum	02
9	5	Measurement of Doppler Frequency, Amplitude	02
10	5 & 6	Measurement of Velocity, RPM	02
Total			20

**SUGGESTED STUDENT ACTIVITIES**

1. Download the information about different applications of satellite and radar communication system.
2. To collect the technical specifications of radar used in ARMY, Aero drum

**SPECIAL INSTRUCTIONAL STRATEGIES (if any)**

- iii. Arrange a visit to any nearby industry.
- iv. Show video/animation film to demonstrate the working principles, constructional features of different types of radar.

## SUGGESTED LEARNING RESOURCES

### DDDD) Books

Sr. No.	Title of Book	Author	Publication
1	Satellite communication	Denis Roddy	Tata McGraw Hill
2	Satellite communication	Dr.D.C.Agarwal	Khanna publication
3	Principals of electronic communication	Louis.E.Frenzel	Tata McGraw Hill
4	Electronic communication system	Kennedy,Devis	Tata McGraw Hill
5	Microwave and radar engineering	M.Kulkarni	Umesh publication

### EEEE) Major Equipment/ Instrument with Broad Specifications

1. Satellite communication trainer
2. Radar trainer
3. Digital storage oscilloscope (100MHz, 2Gsamples/sec)
4. MATLAB or SCILAB software with SIMULINK

### FFFF) Software/Learning/ [Simulations](#) Websites

1. [www.directv.com/learn/pdf/SelfInstallGuide.pdf](http://www.directv.com/learn/pdf/SelfInstallGuide.pdf)
2. [www.connected-earth.com](http://www.connected-earth.com)
3. [www.new.dli.ernet.in/rawdataupload/upload/.../20005bb0\\_268.pdf](http://www.new.dli.ernet.in/rawdataupload/upload/.../20005bb0_268.pdf)
4. [www.geo-orbit.org/sizepgs/sizemainp.html](http://www.geo-orbit.org/sizepgs/sizemainp.html)

### GGGG) Mapping matrix of PO's and CO's:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO-1	2	3	1	2	-	2	3	3	2
CO-2	2	3	-	3	-	2	2	3	3
CO-3	2	2	3	3	-	3	2	3	3
CO-4	3	2	3	3	-	3	3	3	3
CO-5	2	3	3	3	-	3	3	3	3

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : INDUSTRIAL AUTOMATION COURSE CODE: R18 EX5503**  
**COURSE CATEGORY: SPECIALISED CREDIT : 05**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
03	02	3	80	20	50	-	50	200

**Rationale:**

A diploma holder employed in automated manufacturing units/assembly lines, process industry, Power generation stations needs to know about systems/components required for automation of a modern industrial unit. Design concepts have changed to electrical/electronic controls from the conventional mechanical cams/timers, thus making the automation process more flexible and comprehensive.

**Course Outcomes:**

1. Identify different sensors/ transducers and electrical/ hydraulics/ pneumatics component also.
2. Paraphrasing process of designing a automation process
3. Use software for generating solutions in PLC, hydraulics & pneumatics.
4. Work as individual & member of inter discipline team in the management supervision.
5. Assess the safety norms
6. Build entrepreneurship skills

**Course Details:**

UNIT	NAME OF THE TOPIC (with Details)	LEARNING OUTCOME	HOURS	MARKS
1	<b>Industrial Automation:</b> 1.1 Definition, Need, Benefits, Different tools for automation <b>Programmable Logic Controller:</b> 1.2 The difference between PLC and a Microcontroller 1.3 PLC Architecture 1.4 Introduction to PLC components & their assembling 1.5 I/O types, concepts 1.6 Connecting the I/O to PLC 1.7 Understanding the basic concept of	1. Understand the need of automation in industries  2. Understand different automation tools 3. Know about basics of PLC. 4. Understand functions diff. parts of PLC. 5. Understand working of diff. specialty modules.	10	16

	SCAN 1.8 Fixed and Modules PLCs & their types. 1.9 Introduction of HMI			
<b>2</b>	PLC Hardware: 2.1 Discrete input modules: AC input modules, DC 2.2 Analog input modules 2.3 Discrete output modules: AC output modules, DC output modules 2.4 Relay and Isolated o/p modules.(only description) 2.5 Analog output modules - block diagram, description, typical wiring details & specifications. 2.6 I/O module selection criterion. ( block diagram, description, typical wiring details & specifications. )	1. Understand the details of diff. I/O modules of PLC. 2. Understand their wiring connections. 3. Select a proper type of module for specific application.	<b>07</b>	<b>12</b>
<b>3</b>	Programming techniques: 3.1 Programming Input and outputs. 3.2 Logical Commands. 3.3 Arithmetic Commands. 3.4 High Speed Processing Commands. 3.5 Sequential Logics. 3.6 Data Transmission Commands.	1. Understand different programming languages of PLC 2. Develop programming skills using simple programming examples.	<b>07</b>	<b>12</b>
<b>4</b>	PLC networking: 4.1 PLC networking standards 4.2 Vertical integrator of Industrial - automation 4.3 Field bus & Ethernet 4.4 HMI system 4.5 Text display 4.6 Operator panel, Touch panel 4.7 Integrated display – PLC & HMI.	1. Familiar with several common programming interfaces for network communication 2. Describe major technologies and protocols used in network communications. 3. Basic settings and configuration of PLC Communication (Network) modules	<b>7</b>	<b>12</b>
<b>5</b>	<b>Application of PLC and PLC Installation &amp; Troubleshooting:</b> 5.1 Elevator system 5.2 Washing machine 5.3 Tank level control 5.4 Bottle filling plant 5.5 Motor control <b>PLC Installation:</b> 5.6 Enclosures, rack, master control relay, grounding, noise suppression and maintenance guidelines. <b>PLC troubleshooting:</b>	1. Prepare ladder program for different industrial applications. 2. To understand installation details of PLC system. 3. To troubleshoot the PLC system for different faults.	<b>10</b>	<b>16</b>

	5.7 input and output troubleshooting using module LED status, troubleshooting of ladder program.			
<b>6</b>	<b>Actuators &amp; Industrial Applications:</b> 6.1 Types of actuators: Selection criterion for Electro-pneumatic, Electro-hydraulic actuators 6.2 Robots for material transfer, machine loading / unloading, welding, assembly and spray painting operations. 6.3 XY Plotter 6.4 3-D Printer	1.classify various types of actuators. 2. Define the needs, acquire necessary information and select appropriate robots for various industrial applications 3. Understand the working of xy plotter. 4. demonstrate the working of 3D printer	<b>7</b>	<b>12</b>

### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
<b>1</b>	Industrial Automation& PLC	<b>10</b>	<b>8</b>	<b>4</b>	<b>4</b>	<b>16</b>
<b>2</b>	PLC Hardware	<b>7</b>	<b>2</b>	<b>4</b>	<b>6</b>	<b>12</b>
<b>3</b>	Programming Techniques	<b>7</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>12</b>
<b>4</b>	PLC networking	<b>7</b>	<b>2</b>	<b>6</b>	<b>4</b>	<b>12</b>
<b>5</b>	Application of PLC and PLC Installation & Troubleshooting:	<b>10</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>16</b>
<b>6</b>	Actuators & Industrial Applications	<b>7</b>	<b>4</b>	<b>2</b>	<b>6</b>	<b>12</b>
<b>Total</b>		<b>48</b>	26	24	30	<b>80</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
<b>1</b>	<b>1</b>	Use of PID control for Temperature control loop	<b>2</b>
<b>2</b>	<b>3</b>	Ladder program for Start stop logic using two inputs & for push to start and push to stop. (Use single Push Button)	<b>2</b>
<b>3</b>	<b>3</b>	Write and verify ladder program for sequential ON-Off control of Lamps.	<b>2</b>
<b>4</b>	<b>3</b>	Develop & write a Ladder Diagram/Program for Logic Gates. Download the program on PLC & verify/run the same.	<b>2</b>
<b>5</b>	<b>5</b>	Development of ladder program for washing system.	<b>2</b>



6	5	Design of PLC based application using Elevator system	2
7	5	Develop & write a Ladder Diagram/Program for DC Motor control-Start, Stop, Reverse, Forward. Download the program on PLC & verify/run the same.	2
8	5	Develop & write a Ladder Diagram/Program for Level control of 2 Tank system. Download the program on PLC & verify/run the same.	2
9	6	XY Plotter PC based with CAD/CAM software. Develop & draw diagrams message, using CAD/CAM software & make /Plot the same on a paper.	2
10	6	3D Printer-Develop a small Object using 3D Printer	2
11	6	Robotic arm PC based –Study of 5 DOF robotic arm	2
12	6	Study of different actuators-Like, electric based -Linear actuator, rotary actuator(180 deg rotation)	2
<b>Total</b>			

### SUGGESTED STUDENT ACTIVITIES

1. Visit to industry for acquaintance to Automation industry.
2. Learn Problem solving skills.

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of industrial automation.
2. Arrange a visit to nearby small/ medium/large scale manufacturing unit and make a report of sensors, actuators, tools and equipments used.
3. Use Flash/Animations to explain the working of different sensors, actuators and industrial system.
4. Give Mini projects to students.

### SUGGESTED LEARNING RESOURCES

#### HHHH) Books

Sr. No.	Title of Book	Author	Publication (with year)
1	Programmable logic controllers	John Hackworth and Federic Hackworth	Pearson education
2	Intro. To Programmable logic control	Gary Dunning	Cenage Learning
3	Programmable Logic control principles and applications.	NIIT	PHI learning pvt.ltd.
4	Industrial automation and process control	Jon Stenerson	Prentice Hall
5	Robotics and Flexible Automation	S.R. Deb	Tata McGraw Hill
6	Industrial Automation and Robotics	A.K Gupta, S.K. Arora	Laxmi Pubilaction (P) Ltd

### III) Major Equipment/ Instrument with Broad Specifications

Programmable Logic controllers from standard vendors.

IEC 1131-3 compatible programming software.

- Limit switches, proximity switches, push buttons, Relays, Lamps.
- Single phase motor, 24V-DC motor, solenoid Valve, Fan, Heater.
- Setup for actual working processes (No simulation)

a) XY Plotter

b) 3-D Printer

c) Robotic Arm

d) conveyor system

### JJJJ) Software/Learning/ [Simulations](#) Websites

- Ladder Programming: RS logix 500
- [www.learningpit.com](http://www.learningpit.com) - for download of trial version of PLC simulation software.
- [www.plctutor.com](http://www.plctutor.com) - for PLC tutorials.

### Mapping matrix of PO's/PSO's and CO's:

Course Outcome	Program Outcome							Program Specific Outcome	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2	2	-	-	-	1	-	2	-
CO2	1	2	2	2	1	1	1	2	2
CO3	2	-	-	2	-	-	1	2	1
CO4	2	1	2	2	1	2	2	2	2
CO5	2	2	1	2	2	2	2	1	1
CO6	-	1	2	2	2	3	2	2	2

**H: High(3) M: Moderate(2) and L:Low(1) Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE : MECHATRONICS COURSE CODE: R18 EX5504**  
**COURSE CATEGORY : SPECIALISED CREDIT : 05**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
03	02	3	80	20	50	-	50	200

**Rationale:**

Mechatronics, as an engineering discipline, is the synergistic combination of Mechanical, Electronics, Control Engineering and Computers, all integrated through the design process. It involves the application of complex decision making to the operation of physical systems. Mechatronics depends their unique functionality on computer software. This course studies Mechatronics at a theoretical and practical level; balance between theory/ analysis and hardware implementation is emphasized; emphasis is placed on physical understanding rather than on mathematical formalities. A problem- solving approach is used throughout the course.

**Course Outcomes:**

1. Describe the knowledge, techniques, skills and modern tools in Mechatronics engineering technology.
2. Select an appropriate sensor for measuring mechanical quantities and develop data acquisition system that produces accurate Measurement.
3. Relate various signal conditioning units, amplifiers and their role in programmable logic for functioning of Mechatronics systems.
4. Compare and suggest appropriate components for Mechatronics system
5. Design a Mechatronics system or process to meet desired needs within realistic constraints, such as economic, environmental and/or social
6. Apply problem solving skills, including the ability to identify problems, conduct experiments, gather data, analyze data, and produce results.

**Course Details:**

UNIT	NAME OF THE TOPIC (with Details)	LEARNING OUTCOME	HOURS	MARKS
1	<b>Introduction to Mechatronics:</b> 1.1 Introduction and Definition of Mechatronics 1.2 Scope and it's importance with respective Inter – disciplinary approach 1.3 Origins, Evaluation of Mechatronics 1.4 Classification of Mechatronics System	1. Know the synergistic integration technique for mechatronics systems.  2. Describe the role of electronics in mechatronics	10	16

	1.5 Functions of Mechatronics System 1.6 Mechatronics key Elements 1.7 Role of Electronics in Mechatronics 1.8 Mechatronics System Design. 1.9 Ways of Integration. 1.10 Integrated design issues in Mechatronics	system design.		
<b>2</b>	<b>Sensor Modeling:</b> 2.1 Temperature sensing: Thermocouple 2.2 Strain, Stress and Force Measurement using Strain Gauges. 2.3 Piezoelectric Strain Sensors and Accelerometer 2.4 Analog Position Measurement : Potentiometers 2.5 Digital Position Measurement: Optical Encoders 2.6 Velocity Measurement: Tachometers	1. Determine selection criterion for appropriate sensor.  3. Learn the application of different sensors in Mechatronics.	<b>07</b>	<b>12</b>
<b>3</b>	<b>Signal Conditioning and Data Acquisition :</b> 3.1 Introduction and Basic Principle of operation of Signal conditioning. 3.2 Use of Bridge Circuits: Wheatstone Bridge 3.3 Protection Circuits 3.4 The Operational Amplifiers as Amplifiers, Filtering, Comparator, Sample and Hold circuits. 3.5 Instrumentation amplifier ICs AD633, AD522/524 with specifications 3.6 A to D and D to A converter related to Mechatronics application	1. Calculate balancing resistance of Wheatstone bridge for strain measurement. 2. Describe the need of analog signal conditioning circuits. 3. Interpret electrical/ electronic component specifications	<b>07</b>	<b>12</b>
<b>4</b>	<b>Programmable Logic Controller(PLC)</b> 4.1 Basic PLC structure, principle of PLC 4.2 Architecture and components 4.3 PLC programming 4.4 Selection of PLC 4.5 Interfacing of sensors with PLC. 4.6 PLC applications 4.7 Ladder diagrams circuits 4.8 Simple Ladder programming examples <b>Data Presentation System:</b> 4.9 Computer based data acquisition system. 4.10 Multichannel Data Logger (Block diagram),	1. Develop simple ladder diagrams for given examples  2. Demonstrate the use of logic operations, components of PLC and their functioning by ladder rules/programming.	<b>7</b>	<b>12</b>
<b>5</b>	<b>Actuation Systems:</b> <b>5.1 Pneumatic and Hydraulic systems:</b> Actuation system, Directional control valve, Pressure control valves, Cylinders, Process control valve <b>5.2 Electrical Actuation Systems:</b> Electrical Systems ,solid state switches, Solenoids, Relays, DC Motors, AC motors and Stepper Motor (selection criteria and specification) <b>5.3 Mechanical Actuation Systems:</b>	1. Identify electrical/ hydraulics/ pneumatics component  2. Explain about limitation & advantages of each component  3. Recognize the need of various drives in mechanical system .	<b>10</b>	<b>16</b>

	Mechanical Systems, Types of Motion, Kinematic Chains, Cams Gear Trains, Ratchet and Pawl, Belt and chain Drives, Bearing, Mechanical Aspects of Motor Selection.			
<b>6</b>	<b>Advanced Applications in Mechatronics:</b> <b>Mechatronics Control in Automated Manufacturing:</b> 6.1 Monitoring of Manufacturing Processes 6.2 On-Line Quality Monitoring, Model Based Systems 6.3 Hardware in the loop Simulation 6.4 Supervisory control in manufacturing 6.5 Inspection, Integration of Heterogeneous Systems. <b>Artificial Intelligence in Mechatronics:</b> 6.6 Artificial Neural Networks in Mechatronics and Quality Control.	1. Identify the intelligent devices used in Mechatronics for online and real time monitoring which includes diagnosis and control of processes.  2. Discuss the emerging trends like artificial intelligence in simulation, modeling and smart manufacturing.	<b>7</b>	<b>12</b>

### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
<b>1</b>	<b>Introduction to Mechatronics</b>	<b>9</b>	<b>8</b>	<b>4</b>	<b>4</b>	<b>16</b>
<b>2</b>	<b>Sensor Modeling</b>	<b>8</b>	<b>2</b>	<b>4</b>	<b>6</b>	<b>12</b>
<b>3</b>	<b>Signal Conditioning and Data Acquisition</b>	<b>7</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>12</b>
<b>4</b>	<b>Programmable Logic Controller(PLC) &amp; Data Presentation System</b>	<b>8</b>	<b>2</b>	<b>6</b>	<b>4</b>	<b>12</b>
<b>5</b>	<b>Actuation Systems</b>	<b>9</b>	<b>6</b>	<b>6</b>	<b>4</b>	<b>16</b>
<b>6</b>	<b>Advanced Applications in Mechatronics</b>	<b>7</b>	<b>8</b>	<b>2</b>	<b>2</b>	<b>12</b>
<b>Total</b>		<b>48</b>				<b>80</b>

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### SUGGESTED EXERCISES/PRACTICALS

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Appro. Hrs. Required
<b>1</b>	<b>2</b>	Plot the characteristics of pressure transducer (strain gauge/any pressure sensor).	<b>2</b>
<b>2</b>		Plot the characteristics of temperature transducer (thermocouple / RTD/Thermistor).	<b>2</b>
<b>3</b>		Position Measurement by using Analog and Digital Sensors.	<b>2</b>
<b>4</b>		Perform Displacement, velocity and Acceleration Measurement (Conversion of Non electrical parameter into electrical parameter).	<b>2</b>
<b>5</b>	<b>3</b>	Measurement of Temperature using Instrumentation Amplifier IC.	<b>2</b>

6	4	Computer based Data Acquisition system	2
7		PLC Programming: Write simple PLC program and execute on PLC	2
8		Measurement of Multiple input signals using Multichannel Data Logger.	2
9	5	Electro hydraulic components (Electro Hydraulic trainer Kit and Simulator)	2
10		Electro pneumatic components (Electro Pneumatic trainer kit and Simulator)	2
11		Mechanical Actuating Components	2
12	6	Mechatronics case study of ROBOTICS – operation of pick and place robot including programming in linear / circular mode.	2
<b>Total</b>			<b>24</b>

### SUGGESTED STUDENT ACTIVITIES

1. Visit to industry for acquaintance to Mechatronics based system.
2. Learn Problem solving skills.

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of Mechatronics systems.
2. Arrange a visit to nearby small scale manufacturing unit and make a report of sensors, actuators, tools and equipments used.
3. Use Flash/Animations to explain the working of different sensors, actuators and mechatronics system.
4. Give Mini projects to students.

### SUGGESTED LEARNING RESOURCES

#### KKKK) Books

Sr. No.	Title of Book	Author	Publication (with year)
1	Mechatronics Principles concepts and applications	N.P.Mahalik	Tata McGraw Hill
2	Mechatronics Electronics Control System in Mechanical and Electrical Engineering	W. Bolton	Pearson Education
3	Introduction to Mechatronics and Measurement Systems	David Alcitore, Michael B. Histan	Tata McGraw Hill
4	Mechatronics (integrated mechanical electronics systems)	K.P.Ramchandran, G.K.Vijayaraghavan M.S.Balsundarm	Wiley India pvt.ltd (first edition)

#### LLLL) Major Equipment/ Instrument with Broad Specifications

1. Computer based Data Acquisition system (8 I/O to measure parameters of DC motors)
2. Data logger (4 inputs)
3. Hydraulic Trainer (including Cylinders, pressure regulating valves with 3 ph motor and an oil sump)
4. Pneumatic trainer (including cylinders, valves, compressor etc and contact switches)

5. Analog 1000 Allan Bradley PLC (8 DI/O,2 analog I/O)

MMMM) Software/Learning/ [Simulations](#) Websites

- Matlab/simulink
- Labview
- Ladder Programming: RS logix 500

**Mapping matrix of PO's/PSO's and CO's:**

Course Outcome	Program Outcome							Program Specific Outcome	
	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO2
CO1	2	2	2	3	-	2	2	2	-
CO2	1	2	3	3	-	1	2	1	2
CO3	2	2	2	3	-	2	1	1	2
CO4	1	2	1	1	1	-	-	2	2
CO5	1	2	2	2	2	2	2	1	2
CO6	1	2	2	2	-	2	2	2	2

**H: High (3) M: Moderate (2) and L:Low (1) Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**  
**COURSE: NETWORK COMMUNICATION** **COURSE CODE: R18EX5505**

**COURSE CATEGORY : SPECIALISED CREDIT : 05**

**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
03	02	3	80	20	50	--	50	200

**Rationale:**

In today's networking environment, we need to know about different networking technologies and configurations. Networking of computer is necessary in various business applications like online Banking, Railway Reservation, Industrial Automation, E-Business, E-Commerce etc. So we need to know the basic concept of networking, its applications, topologies, communication media, network directing devices, protocol used, OSI reference model and TCP/IP model, network devices and Network operating system, installation and applications.

**Course Outcomes:**

1. Identify different network topologies and protocols.
2. Use Medium access control protocol concepts to deal with network congestion issues.
3. Build the skills of subnetting and routing mechanisms.
4. Compare TCP and UDP protocols.
5. Elaborate the functions and protocols of application layer
6. Illustrate the concepts of different communication networks and network security mechanisms

**Course Details:**

UNIT	NAME OF THE TOPIC	LEARNING OUTCOME	HOURS	MARKS
1	<b>Physical and Data link layer</b>  1.1 Types of Networks -LAN,MAN,WAN, 1.2 Network Hardware-network topology 1.3 HUB, Bridge, Router, Repeater, Gateway 1.4 Design issues for the layers 1.5 Connection Oriented & Connectionless services. 1.6 Reference Models - OSI & TCP/IP, their comparison. <b>The Physical Layer:</b>  1.7 Transmission Media – magnetic media, twisted pair, coaxial cable, fiber optics, radio, Microwave, infrared &	1a. Explain type of networks and network components. 1b.Explain physical and data link layer.	10	16



	<p>light wave.</p> <p><b>The Data Link Layer:</b></p> <p><b>1.8</b> Data Link Layer Design issues, Error Detection &amp; Correction</p> <p><b>1.9</b> Automatic Repeat Request. - Stop and Wait ARQ</p> <p><b>1.10</b> Sliding Window Protocols. - 1 bit sliding window protocol</p>			
<b>2</b>	<p><b>Medium Access Sub layer</b></p> <p><b>2.1</b> Channel Allocation Problem – Static &amp; Dynamic</p> <p><b>2.2</b> Multiple Accesses protocols – ALOHA, CSMA</p> <p><b>2.3</b> Collision Free Protocols</p> <p><b>2.4</b> Ethernet cabling, The Ethernet MAC sub layer Protocol</p> <p><b>2.5</b> Wireless LAN- The 802.11 Protocol stack</p> <p><b>2.6</b> IEEE 802.3 (CSMA/CD),IEEE 802.4 (Token Bus),IEEE 802.5 (Token Ring)</p> <p><b>2.7</b> Bluetooth Architecture: Piconet, Scatternet</p>	<p>2a. Explain wireless LAN.</p> <p>2b. compare static and dynamic channel allocation.</p> <p>2c. Understand various MAC protocols.</p>	<b>07</b>	<b>12</b>
<b>3</b>	<p><b>The Network Layer</b></p> <p><b>3.1</b> Network layer Design issues.</p> <p><b>3.2</b> Circuit Switching and Packet Switching</p> <p><b>3.3</b> Routing Algorithms- The optimality Principal</p> <p><b>3.4</b> Shortest Path routing</p> <p><b>3.5</b> The network layer in the internet – the IP protocol</p> <p><b>3.6</b> IP addresses subnets.</p>	<p>3a. compare circuit switching and packet switching</p> <p>3b. Explain various routing algorithms.</p>	<b>07</b>	<b>12</b>

	<b>3.7 Address Resolution Protocol</b>			
<b>4</b>	<b>The Transport Layer</b> <b>4.1</b> Processes-To-Process Delivery. <b>4.2</b> The Internet Transport Protocols (TCP) , Port Numbers <b>4.3</b> TCP Services, Numbering bytes, Sequence Number. <b>4.4</b> TCP Segment Header. <b>4.5</b> TCP Connection-Connection Establishment, Termination & Resetting. <b>4.6</b> State Transition Diagram. <b>4.7</b> User Datagram Protocol (UDP) and its applications	4a. Explain TCP protocol. 4b. Compare TCP and UDP protocol.	<b>07</b>	<b>12</b>
<b>5</b>	<b>The Application Layer</b> <b>5.1</b> Client –Server model <b>5.2</b> Socket Interface <b>5.3</b> Domain name system (DNS) <b>5.4</b> Electronic mails (SMTP) and File Transfer (FTP) <b>5.5</b> HTTP- The hypertext transfer protocol <b>5.6</b> World Wide Web- Architectural overview <b>5.7</b> Introduction to digital audio and Concept and applications of Internet Radio	5a. Explain different application layer protocols. 5b. Explain the concept of digital audio and internet radio.	<b>07</b>	<b>12</b>
<b>6</b>	<b>Communication networks and security</b> <b>6.1</b> Concept of ISDN <b>6.2</b> principals of broadband ISDN and Architecture of B-ISDN <b>6.3</b> Concept of ATM <b>6.4</b> Features of ATM, Definitions:	6a.Explain ISDN. 6b. Explain cryptography.	<b>10</b>	<b>16</b>

	CBR,VBR,ABR,UBR <b>6.5</b> ATM reference model <b>6.6</b> Concept of cryptography <b>6.7</b> Cryptographic principles <b>6.8</b> Secret key algorithms <b>6.9</b> Digital signature <b>6.10</b> security services: concepts of message and entity security services, Firewall			
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#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Physical and Data link layer	10	04	08	04	16
2	Medium Access Sub layer	07	02	06	04	12
3	The Network Layer	07	02	06	04	12
4	The Transport Layer	07	04	06	02	12
5	The Application Layer	07	04	06	02	12
6	Communication networks and security	10	02	08	06	16
Total		64	18	40	22	80

**Legends:** R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy) **Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

#### SUGGESTED EXERCISES/PRACTICALS (any 8)

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx. Hrs. Required
1	1	Using a Hub/ Switch Install a LAN network consisting of 6 computers	02
2	1	Implementation of LAN using star topology and connectivity between two computers using cross over UTP CAT5 cable.	02
3	2	Configuration of simple CSMA/CA network to study CSMA/CA protocols	02
4	2	Create a network using Bluetooth (piconet/scatternet)	02
5	3	Configure static and dynamic IP addresses	02

<b>6</b>	<b>4</b>	Configure/Test Internet connectivity.	<b>02</b>
<b>7</b>	<b>4</b>	Run basic TCP/IP utilities and network commands like ipconfig, ping etc.	<b>02</b>
<b>8</b>	<b>5</b>	Installation and configuration of Network Application FTP.	<b>02</b>
<b>9</b>	<b>5</b>	Installation and configuration of Network Application Telnet.	<b>02</b>
<b>10</b>	<b>6</b>	Install and configure a Firewall for the network security	<b>02</b>
<b>Total</b>			<b>16/20</b>

### SUGGESTED STUDENT ACTIVITIES

1. Download the information about different protocols used in communication systems.
2. Collect the information about cryptography.

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Show video/animation film to demonstrate the network layers.
2. Arrange a visit to any nearby LAN networking lab.

### SUGGESTED LEARNING RESOURCES

#### NNNN) Books

<b>Sr. No.</b>	<b>Title of Book</b>	<b>Author</b>	<b>Publication (with year)</b>
<b>1</b>	Computer Networks	Andrew S. Tanenbaum	Pearson Education
<b>2</b>	Data & Computer Communications	William Stallings	Printice-Hall India
<b>3</b>	Computer Networks and Internetworking	D. E. Comer	Pearson Education
<b>4</b>	Data Communication & Networking	Behrouz A. Forouzan.	Tata McGraw-Hill.

#### OOOO) Major Equipment/ Instrument with Broad Specifications:

1. Medium level Configuration computer with installed OS
2. Network toolkit: clamping, crimping tool, network tester, line tester
3. Router, Repeater, Bridges: Latest configuration
4. Firewall with high security and high storage
5. CISCO Packet tracer software

#### PPPP) Software/Learning/ [Simulations](#) Websites

1. <http://www.cengagebrain.co.nz/content/9781133893820.pdf>
2. [http://iwayan.info/Lecture/ISDN\\_S1/chap05b\\_OverviewISDN.PDF](http://iwayan.info/Lecture/ISDN_S1/chap05b_OverviewISDN.PDF)
3. [http://www.webopedia.com/TERM/L/local\\_area\\_network\\_LAN.html](http://www.webopedia.com/TERM/L/local_area_network_LAN.html)
4. <http://www.csie.ntpu.edu.tw/~yschen/course/2011-2/CN/Chapter2.pdf>
5. [http://tristan.host.cs.st-andrews.ac.uk/teaching/cs78\\_spring05/slides/transport-layer.pdf](http://tristan.host.cs.st-andrews.ac.uk/teaching/cs78_spring05/slides/transport-layer.pdf)

**QQQQ) Mapping matrix of POs and COs**

<b>Course Outcomes</b>	<b>Programme Outcomes</b>							<b>PSO</b>	
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PSO1</b>	<b>PSO2</b>
CO-1	2	2	1	2	-	2	1	2	1
CO-2	2	2	1	2	1	2	1	2	2
CO-3	2	2	2	1	1	2	1	1	1
CO-4	2	2	2	2	1	2	2	1	1
CO-5	2	2	2	2	1	1	--	--	--
CO-6	2	2	2	2	1	2	2	--	--

**3: High 2: Moderate and 1:Low Relationship**

**MPECS 2018 Scheme**  
**CUSROW WADIA INSTITUTE OF TECHNOLOGY PUNE-1**

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**DIPLOMA PROGRAMME: ELECTRONICS AND TELECOMMUNICATION ENGINEERING**

**COURSE: WIRELESS COMMUNICATION**

**COURSE CODE: R18 EX5506**

**COURSE CATEGORY : SPECIALISED**

**CREDIT : 5**

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**Teaching and Examination Scheme:**

Teaching Scheme		Examination Scheme						
TH	PR	PAPER HRS.	TH	TEST	PR	OR	TW	TOTAL
3	2	3	80	20	50	-	50	200

**Rationale:** The rapid progress and convergence of the field has created a need for new techniques and solutions, knowledgeable professionals to create and implement them, and courses to teach the background theory and technologies while pointing the way towards future trends.

As cellular telephones become commonplace business tools, interest in wireless technology is booming. This course responds to that demand with comprehensive survey of field. Wireless communication focuses on the cellular fundamentals including frequency reuse, channel assignments, third generation technologies. Also it covers concepts of upcoming technologies like OFDM, UWB etc.

**Course Outcomes:**

1. Evaluate different traffic engineering parameters.
2. Illustrate GSM system.
3. Identify protocol for audio and video calling using internet.
4. Compare channel structures of GSM and CDMA.
5. Categorize different next generation mobile standards.
6. Create a platform for future development in the area of wireless communication.

**Course Details:**

UNIT	NAME OF THE TOPIC	MAJOR LEARNING OUTCOME	HOURS	Marks
01	<b>The cellular concept</b> <b>1.1</b> Evolution and comparison of wireless standards (1G, 2G, 3G and 4G,5G) <b>1. 2</b> Concept of the cell site, cell geometry <b>1.3</b> Definitions: offered load, busy hour, GOS, average calling time, trunking efficiency, base station, forward channel,	1a. Compare different generations of wireless standards 1b. Explain the concept of frequency reuse. 1c. Describe the interferences in mobile	07	12

	<p>reverse channel, control channel.</p> <p><b>1.4</b> Numerical based on Erlang B table</p> <p><b>1.5</b> Frequency reuse concept and numerical</p> <p><b>1.6</b> Co-channel and adjacent channel interference</p> <p><b>1.7</b> Block diagram and working of mobile phone unit</p>	<p>communication.</p> <p>1d. Calculate various traffic engineering parameters</p>		
<b>02</b>	<p><b>Global Systems for Mobile (GSM)</b></p> <p><b>2.1</b> Improving coverage and capacity in cellular system: cell splitting, cell sectoring, Microcell zone concept</p> <p><b>2.2</b> Handoff mechanism: cell boundary scenario, Type of handoff (hard, soft)</p> <p><b>2.3</b> GSM services</p> <p><b>2.4</b> GSM architecture</p> <p><b>2.5</b> IMSI identities (IMEI, IMSI, TMSI)</p> <p><b>2.6</b> GSM radio subsystem</p> <p><b>2.7</b> Frame structure for GSM</p> <p><b>2.8</b> Signal processing in GSM</p> <p><b>2.9</b> GSM call routing: mobile terminated call, mobile originated call</p> <p><b>2.10</b> GSM security aspects</p>	<p>2a. Elaborate the methods to improve spectrum efficiency</p> <p>2b. Explain the handoff mechanism.</p> <p>2c. Describe GSM architecture and security algorithms in GSM.</p> <p>2d. State signal processing and frame structure in GSM.</p>	<b>10</b>	<b>16</b>
<b>03</b>	<p><b>VoIP and signaling systems</b></p> <p><b>3.1</b> OSI model</p> <p><b>3.2</b> Introduction to VoIP</p> <p><b>3.4</b> H.323 network architecture</p> <p><b>3.5</b> H.323 Protocol stack</p> <p><b>3.6</b> SIP architecture</p> <p><b>3.7</b> SIP call establishment (description of various SIP messages)</p> <p><b>3.8</b> SS7: network service part (NSP), message transfer part (MTP), Signaling correction control part (SCCP), SS7 services and performance</p>	<p>3a. Describe OSI model</p> <p>3b. Compare VoIP protocols.</p> <p>3d. Explain SS7 signaling system.</p>	<b>07</b>	<b>12</b>

04	<b>GSM and CDMA Channel structures</b> <b>4.1</b> Frequency and channel allocations (FCA, DCA, HCA) <b>4.2</b> Comparison of FCA, DCA, HCA <b>4.3</b> GSM channels: <b>4.3.1</b> Traffic channels <b>4.3.2</b> Control channels <b>4.4</b> Concept of CDMA <b>4.5</b> IS-95 system architecture <b>4.6</b> CDMA channel structure (tree diagram) <b>4.7</b> Comparison of GSM and CDMA technologies	4a. Compare various channel allocation schemes.  4b. Elaborate GSM and CDMA logical channel structure.  4c. Explain IS-95 architecture.  4d. Compare GSM and CDMA.	07	12
05	<b>3G and advanced wireless standards</b> <b>5.1</b> GPRS Architecture <b>5.2</b> CDMA 2000: features and CDMA 2000 system architecture <b>5.3</b> Concept of WCDMA and Commonality among WCDMA, CDMA2000,TD-CDMA, TD-SCDMA <b>5.4</b> UMTS services <b>5.5</b> UMTS architecture <b>5.6</b> UMTS air interfaces <b>5.7</b> 4G standards concept and features, <b>5.8</b> 4G LTE and VoLTE: concept <b>5.9</b> LTE Advance: features, concept <b>5.10</b> Introduction to concept of 5G	5a. Explain 3G wireless standards  5b. Elaborate 4G wireless standards	10	16
06	<b>Emerging trends in wireless communication</b> <b>6.1</b> fixed wireless networks: WLL and LMDS <b>6.2</b> Concept of Wi-max <b>6.3</b> Concept and applications of UWB <b>6.4</b> Concept of orthogonality <b>6.5</b> Introduction of OFDM	6a.Explain concept and features of different emerging trends.  6b. Explain applications of different technologies.	07	12



	6.6 OFDM transmitter and receiver- block diagram and working			
	6.7 OFDM applications			

#### SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	The cellular concept	07	02	06	04	12
2	Global Systems for Mobile (GSM)	10	04	08	04	16
3	VoIP and signaling systems	07	02	06	04	12
4	GSM and CDMA Channel structures	07	04	04	04	12
5	3G and advanced wireless standards	10	04	08	04	16
6	Emerging trends in wireless communication	07	04	04	04	12
Total		48	20	36	24	80

#### SUGGESTED EXERCISES/PRACTICALS (ANY 8)

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx. Hrs. Required
1	1	Identify different sections and components of mobile phone	02
2	1	Observation and verification of waveforms at various points on 2G mobile trainer kit	02
3	2	To verify various call control GSM AT commands	02
4	2	To verify various phone control and SMS text mode GSM AT commands	02
5	1 and 2	Determine channel capacity of a system based on given parameters	02
6	3	Demonstration of VoIP technique using SIP	02
7	4	Observation and verification of waveforms at various points on CDMA network system	02

8	4	Design of 3/4bit PN sequence	02
9	5	Observation and verification of waveforms at various points on 3G mobile trainer kit.	02
10	6	MATLAB/SCILAB simulation of OFDM using SIMULINK	02
<b>Total</b>			<b>16/20</b>

### SUGGESTED STUDENT ACTIVITIES

Following is the list of proposed student activities like

1. Download different applications of UWB technology.
2. Collect data about recent trends in wireless communication.

### SPECIAL INSTRUCTIONAL STRATEGIES (if any)

1. Show video/animation film to demonstrate the working principles, constructional features, testing and maintenance of different types of electronic and magnetic instruments.
2. Arrange a visit to nearby BTS or MSC and make a report of technology used.

### SUGGESTED LEARNING RESOURCES

#### RRRR) Books

SR.NO.	TITLE of BOOK	AUTHOR	PUBLICATION
1	Mobile Communication Engineering	William C.Y. Lee	McGraw Hill
2	Mobile Communications	Jochen Schiller	Pearson
3	3G wireless networks	Client Smith, Daniel collins	Tata McGraw Hill
4	Wireless Communication Principles &Practice	T.S. Rappaport	Pearson Education
5	IS 95 CDMA and CDMA2000	Vijay K Garg	Pearson Education

#### SSSS) Major Equipment/ Instrument with Broad Specifications

1. 2G mobile trainer kit
2. 3G mobile trainer kit
3. Digital storage oscilloscope (100MHz, 2Gsamples/sec)
4. CDMA trainer kit (DSSS QPSK based)
5. MATLAB or SCILAB software with SIMULINK

#### TTTT) Software/Learning/ Simulations Websites

1. [http://www.tutorialspoint.com/gsm/gsm\\_architecture.htm](http://www.tutorialspoint.com/gsm/gsm_architecture.htm)
2. <https://www.eff.org/files/filenode/Division%20Multiple%20Access%20Technology.pdf>
3. <http://3g-network.blogspot.in/2009/05/cdma2000-mobile-wireless-network.html>
4. <http://www.agir.ro/buletine/687.pdf>
5. [http://www.ieee.li/pdf/viewgraphs/introduction\\_orthogonal\\_frequency\\_division\\_multiplex.pdf](http://www.ieee.li/pdf/viewgraphs/introduction_orthogonal_frequency_division_multiplex.pdf)
6. <https://sites.google.com/site/the4gtelecom/the-cdma-physical-layer>

**D) Mapping matrix of PO's/PSO's and CO's:**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO-1	2	2	3	2	-	1	2	3	2
CO-2	2	2	-	3	-	1	3	3	2
CO-3	2	2	2	3	-	2	2	2	2
CO-4	2	1	-	-	-	2	2	2	-
CO-5	3	2	-	2	1	2	3	2	2
CO-6	2	2	3	3	-	2	3	2	2

**3: High 2: Moderate and 1:Low Relationship**