

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION****ENGINEERING****NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

| <b>COURSE PLAN – PART I</b>  |   |                                 |                                      |
|--|---|---------------------------------|--------------------------------------|
| <b>Name of the programme and specialization</b>  | <b>B.Tech</b>   |                                 |                                      |
| <b>Course Title</b>  | <b>ANTENNAS AND PROPAGATION</b>                           |                                 |                                      |
| <b>Course Code</b>   | <b>ECPC20</b>   | <b>No. of Credits</b>           | <b>03</b>                            |
| <b>Course Code of Pre-requisite subject(s)</b>   | <b>ELECTRODYNAMICS AND ELECTROMAGNETIC WAVES (ECPC12)</b> |                                 |                                      |
| <b>Session</b>   | <b>July 2023</b>  | <b>Section (if, applicable)</b> | <b>A&amp;B</b>                       |
| <b>Name of Faculty</b>   | <b>Dr. D. Sriram Kumar</b>                                | <b>Department</b>               | <b>Electronics and Communication</b> |
| <b>Email</b>   | <a href="mailto:srk@nitt.edu">srk@nitt.edu</a>            | <b>Telephone No.</b>            | <b>94434 94495</b>                   |
| <b>Name of Course Coordinator(s) (if, applicable)</b>  |   |                                 |                                      |
| <b>E-mail</b>  |   | <b>Telephone No.</b>            |                                      |
| <b>Course Type</b>   | <b>Core course</b>  |                                 |                                      |
| <b>Syllabus (approved in BoS)</b>  |   |                                 |                                      |
| <p>Radiation fundamentals. Potential theory. Helmholtz integrals. Radiation from a current element. Basic antenna parameters. Radiation field of an arbitrary current distribution. Small loop antennas.</p> <p>Receiving antenna. Reciprocity relations. Receiving cross section, and its relation to gain. Reception of completely polarized waves. Linear antennas. Current distribution. Radiation field of a thin dipole. Folded dipole. Feeding methods. Baluns.</p> <p>Antenna arrays. Array factorization. Array parameters. Broad side and end fire arrays. Yagi-Uda arrays Log-periodic arrays.</p> <p>Aperture antennas. Fields as sources of radiation. Horn antennas. Babinet's principle. Parabolic reflector antenna. Microstrip antennas.</p> <p>Wave Propagation: Propagation in free space. Propagation around the earth, surface wave propagation, structure of the ionosphere, propagation of plane waves in ionized medium,</p> |   |                                 |                                      |

|  |  |
|--|--|
| Determination of critical frequency, MUF. Fading, tropospheric propagation, Super refraction.                                      |  |
| <b>COURSE OBJECTIVES</b>   |  |
| <b>To impart knowledge on basics of antenna theory and to analyze and design a start of art antenna for wireless communication</b> |  |
| <b>COURSE OUTCOMES (CO)</b>  |  |
| <b>Course Outcomes</b>   | <b>Aligned Programme Outcomes (PO)</b> |
| CO1: select the appropriate portion of electromagnetic theory and its application to antennas.                                     | PO1, PO3, PO4, PO6, PO7                |
| CO2: distinguish the receiving antennas from transmitting antennas, analyze and justify their characteristics.                     | PO1, PO3, PO4, PO6, PO7, PO11          |
| CO3: assess the need for antenna arrays and mathematically analyze the types of antenna arrays                                     | PO1, PO3, PO4, PO6, PO7, PO11, PO12    |
| CO4: distinguish primary from secondary antennas and analyze their characteristics by applying optics and acoustics principles     | PO1, PO3, PO4, PO6, PO7, PO11, PO12    |
| CO5: outline the factors involved in the propagation of radio waves using practical antennas                                       | PO1, PO3, PO4, PO6                     |

| <b>COURSE PLAN – PART II</b>   |                                |  |  |
|--|--------------------------------|--|--|
| <b>COURSE OVERVIEW</b>   |                                |  |  |
| <p><b>Students will be introduced to antennas, their principle of operation, analysis and their applications. The course provides introduce the student to wave propagation over ground, through troposphere and ionosphere, propagation effects in radio frequencies.</b></p> |                                |  |  |
| <b>COURSE TEACHING AND LEARNING ACTIVITIES</b>   |                                |  |  |
| <b>S.No.</b>   | <b>Week/Contact Hours</b>      | <b>Topic</b>   | <b>Mode of Delivery</b>                  |
| 1  | 1 <sup>st</sup> Week of August | Radiation fundamentals. Potential theory. Helmholtz integrals.   | Lecture<br>C&T/ PPT or any suitable mode |
| 2  | 2 <sup>nd</sup> Week of August | Radiation from a current element. Basic antenna parameters. Radiation field of an arbitrary current distribution |  |

|    |   |   |   |
|----|---|---|---|
| 3  | <b>3<sup>rd</sup> Week of August</b>    | Small loop antennas.<br>Receiving antenna. Reciprocity relations  | Lecture<br>C&T/ PPT or any<br>suitable mode |
| 4  | <b>4<sup>th</sup> Week of August</b>    | Receiving cross section, and its relation to gain. Reception of completely polarized waves. Linear antennas |   |
| 5  | <b>5<sup>th</sup> Week of August</b>    | Current distribution. Radiation field of a thin dipole.   |   |
| 6  | <b>1<sup>st</sup> Week of September</b> | Folded dipole. Feeding methods, Baluns.<br><b>ASSESSMENT-1</b>  |   |
| 7  | <b>2<sup>nd</sup> Week of September</b> | Antenna arrays. Array factorization.  |   |
| 8  | <b>3<sup>rd</sup> Week of September</b> | Array parameters. Broad side and end fire arrays  |   |
| 9  | <b>4<sup>th</sup> Week of September</b> | Uda arrays Log-periodic arrays. Aperture antennas. Fields as sources of radiation.                          |   |
| 10 | <b>1<sup>st</sup> Week of October</b>   | Horn antennas. Babinet's principle, Parabolic reflector antenna.<br><b>ASSESSMENT-2</b>                     |   |
| 11 | <b>2<sup>nd</sup> Week of October</b>   | Microstrip antennas.  |   |
| 12 | <b>3<sup>rd</sup> Week of October</b>   | Wave Propagation: Propagation in free space. Propagation around the earth                                   |   |
| 13 | <b>4<sup>th</sup> Week of October</b>   | surface wave propagation structure of the ionosphere  |   |
| 14 | <b>5<sup>th</sup> Week of October</b>   | propagation of plane waves in ionized medium Determination of critical frequency                            |   |
| 15 | <b>1<sup>st</sup> Week of November</b>  | MUF. Fading, tropospheric propagation, Super refraction<br><b>REASSESSMENT</b>                              |   |

| S.No. | Mode of Assessment            | Week/Date                         | Duration    | % Weightage |
|-------|-------------------------------|-----------------------------------|-------------|-------------|
| 1     | Assessment-I                  | 1 <sup>st</sup> Week of September | 60 minutes  | 20          |
| 2     | Assessment-II                 | 2 <sup>st</sup> Week of October   | 60 Minutes  | 20          |
| 3     | ASSIGNMENT, SEMINAR(Optional) |                                   |             | 10          |
| CPA   | Compensation Assessment*      | 2 <sup>nd</sup> Week of November  | 60 Minutes  |             |
| 5     | Final Assessment *            | 1 <sup>st</sup> Week of December  | 180 Minutes | 50          |

**\*mandatory; refer to guidelines on page 4**

**COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)**

Feedback from the students during class committee meetings

Anonymous feedback through questionnaire

**COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)**

**MODE OF CORRESPONDENCE (email/ phone etc)**

1. All the students are advised to come to the class regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/any other information regarding this course) will be intimated in the Class only.

**COMPENSATION ASSESSMENT POLICY**

1. Attendance will be taken by the faculty in all the contact hours. Every student should maintain minimum 75 % physical attendance in these contact hours along with assessment criteria to attend the end semester examination.
2. Any student who fails to maintain 75% attendance needs to appear for the compensation assessment (CPA). A student who scores more than 60 % marks in the CPA along with assessment criteria will be eligible for attending the end semester examination.
3. Those students who have attendance lag and also missed any of the continuous assessments (CAs) can appear for CPA to get eligibility for writing the end semester examination as quoted in Pt. 3. Their scores in the CPA WILL NOT be considered for computing marks for CA.
4. Students not having 75% minimum attendance at the end of the semester and fail in CPA (scoring less than 60%) will have to RE DO the course.

**ATTENDANCE POLICY** (A uniform attendance policy as specified below shall be followed)

- **At least 75% attendance on each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

**ACADEMIC DISHONESTY & PLAGIARISM**

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded to the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.


The above policy against academic dishonesty shall be applicable for all the programmes.

**ADDITIONAL INFORMATION**

**FOR APPROVAL**

Course Faculty 

CC-Chairperson 

HOD  07-08-2023

**Guidelines:**

- a) The number of assessments for a course shall range from 4 to 6.
- b) **Every course shall have a final assessment on the entire syllabus with at least 30% weightage.**
- c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.**
- d) **The passing minimum shall be as per the regulations.**

| B.Tech. Admitted in                             |      |   |      | P.G. |
|---|------|---|------|------|
| 2022  | 2021 | 2020  | 2019 |      |
| 35% or class average/2<br>whichever is greater. |      | Peak/3 or class average/2<br>whichever is lower |      | 40%  |

- e) **Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.**
- f) **An absolute grading policy shall be incorporated if the number of students per course is less than 10.**
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.