**SWARNANDHRA COLLEGE OF ENGINEERING & TECHNOLOGY**

AUTONOMOUS

Accredited by National Board of Accreditation, AICTE, New Delhi

Accredited by NAAC with “A” Grade-3.32/4.00 CGPA,

Recognised under 2(f)&2(B) of UGC Act 1956,Approved by AICTE,

Permanently Affiliated to JNTUK, Kakinada

SEETHARAMPURAM, NARSAPURAM-534 280, W.G.DT.,

**B Tech II SEMESTER**

**DIFFERENTIAL EQUATIONS & VECTOR CALCULUS**

**(Common to CE, EEE, ME)**

**SYLLABUS (R19)**

**Course Objectives:**

1. To enlighten the learners in the concept of differential equations and vector calculus.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

**Unit I: Ordinary Differential equations of first order and first degree:**

Linear differential equations – Bernoulli’s equations – Exact equations and equations reducible to exact form.

Applications: Newton’s Law of cooling – Law of natural growth and decay – Orthogonal trajectories

**Learning Outcomes:**

At the end of this unit, the student will be able to

* solve first order differential equations by appropriate method (K3)
* apply to geometrical and real world problems (K3)

**Unit II: Linear differential equations of higher order:**

Solutions of Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e*ax*, sin ax, cos ax, polynomials in xn, e*ax* V(x) and xnV(x) – Method of Variation of parameters.

Applications: LCR circuit

**Learning Outcomes:**

At the end of this unit, the student will be able to

* identify the essential characteristics of linear differential equations with constant coefficients (K3)
* solve the linear differential equations with constant coefficients by appropriate method (K3)

**Unit –III: Partial Differential Equations of First Order**:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

**Learning Outcomes:**

At the end of this unit, the student will be able to

* apply a range of techniques to find solutions of standard PDEs (K3)
* outline the  basic properties of standard PDEs  (K2)

**Unit IV: Vector differentiation**

Scalar and vector point functions, vector operator del, del applied to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, physical interpretation of Gradient Div F and Curl F, Del applied twice to point functions Del applied to products of point functions.

**Learning Outcomes:**

At the end of this unit, the student will be able to

* apply del to Scalar and vector point functions (K3)
* illustrate the physical interpretation of Gradient, Divergence and Curl (K3)

**Unit V: Vector integration**

Integration of VectorsLine integral-circulation-work done, surface integral-flux, Green’s theorem in the plane (without proof), Stoke’s theorem (without proof), volume integral, Divergence theorem (without proof).

**Learning Outcomes:**

At the end of this unit, the student will be able to

* find the work done in moving a particle along the path over a force field (k3)
* evaluate  the rate of fluid flow along and across curves (K3)
* apply Green’s, Stokes and Divergence theorem in evaluation of double and triple integrals (K3)

**Textbooks:**

1. B. S. Grewal, Higher Engineering Mathematics, 42/e, Khanna publishers, 2012.

**References:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2013.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

**Course Outcomes:**

At the end of the course, the student will be able to

1. solve the  differential equations related to various engineering fields (K3)
2. identify solution methods  for partial differential equations that model physical processes (K3)
3. interpret the physical meaning of scalar and vector point functoins different operators such as del,gradient, curl and divergence (K3)
4. estimate the work done against a field, circulation and flux using vector calculus and familiarize vector integral theorems. (K3)