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<tr><td>Course Code</td><td colspan="6">PEU3202</td></tr>
<tr><td>Level</td><td colspan="6">03</td></tr>
<tr><td>Course Title</td><td colspan="6">Vector Spaces</td></tr>
<tr><td>Credit value</td><td colspan="6">2</td></tr>
<tr><td>Core/Optional</td><td colspan="6">Core</td></tr>
<tr><td>Prerequisites</td><td colspan="6">PEU3300 (Pass / valid OCAM / CR) and PEU3301 (Pass / valid OCAM / CR)</td></tr>
<tr><td rowspan="2">Hourly breakdown</td><td colspan="2">Theory</td><td>Practical hours</td><td>Independent Learning</td><td>Assessments</td><td>Total hrs</td></tr>
<tr><td>15X 2 = 30 hrs</td><td>DS hrs = 4X3 = 12 hrs</td><td>-</td><td>▪ Sessions (15x 3) = 45 hrs
▪ Online /Audio-visual materials and other learning resources = 11 hrs</td><td>▪ Continuous Assessments (CA) = 2 hrs</td><td>100</td></tr>
<tr><td>Course Aim/s.</td><td colspan="6">Use Vector spaces in mathematical and science applications</td></tr>
<tr><td>PLOs addressed by course</td><td colspan="6">PLO1: Knowledge: Explain the fundamental, principles and broader knowledge pertaining to the chosen science disciplines offered for the degree.
PLO2: Practical Knowledge and Application. Demonstrate the competency to use the knowledge and practical skills appropriately.
PLO3: Communication: Demonstrate the competency in communicating efficiently and effectively to present information, ideas and concepts to the scientific community as well as to the wider society.
PLO4: Individual Work, Team Work and Leadership: Demonstrate the competency in working independently and in groups in addressing issues in multi-disciplinary environments and completing the tasks on time through collaborative learning while exhibiting leadership.
PLO5: Creativity and Problem Solving: Identify and analyze problems using quantitative and/or qualitative approaches using scientific methodology to provide valid conclusions.</td></tr>
<tr><td>Course Learning Outcomes (CLO)</td><td colspan="6">At the completion of this course student will be able to
CLO1: Define a field and Identify that a given set is a field under two operations (addition and multiplication) defined on the set. (PLO1)
CLO2: Define a vector space over a field F and identify/justify/prove that a given set of vectors is a vector space over a field F under the vector addition and scalar multiplication define on the set of vectors. (PLO1, PLO2, PLO3, PLO4, PLO5)
CLO3: Define subspace of a vector space and identify/justify/prove that a given non empty set of vectors is a subspace of a given vector space. (PLO1, PLO2, PLO3, PLO4, PLO5)
CLO4: Define spanning set, basis of a vector space and finite dimensional vector space and use these definitions (PLO1, PLO2, PLO3, PLO4, PLO5)
CLO5: Define linear Independence and linear dependence and prove that a given set of vectors are linearly independent or not. (PLO1, PLO2, PLO3, PLO4, PLO5)
CLO6: Define linear transformation between two vector spaces, kernel and image of a linear transformation and to be able to use these definitions. To be able to prove that a given map between two vector spaces is a linear transformation. (PLO1, PLO2, PLO3, PLO4, PLO5)
CLO7: Define vector space Hom(V,W) and Isomorphism between two vector spaces and prove that a given map between two vector spaces is an Isomorphism. (PLO1, PLO2, PLO3, PLO4, PLO5)
CLO8: Define rank and nullity of a linear transformation and prove that the relationship between rank and nullity of a linear transformation. (nullity rank theorem) (PLO1, PLO2, PLO3, PLO4, PLO5)
CLO9: Define invariant subspaces and Inner product subspaces and use these definitions. (PLO1, PLO2, PLO3, PLO4, PLO5)
CLO10: Find the length of a vector in an invariant subspaces / Inner product subspaces, and find the distance and concept angle between two vectors in an Invariant subspaces/ Inner product subspaces. (PLO1, PLO2, PLO3, PLO4, PLO5)
CLO11: Define the Euclidian space and use this definition. To be able to find the length of a vector in the Euclidean space, and to find the distance and concept angle between two vectors in the Euclidean space(PLO1, PLO2, PLO3, PLO4, PLO5)
CLO12: Define the orthogonal set in the Euclidian space and Orthonormal Base in the Euclidian space and use these definitions. Use Gram – Schmidt Orthonormalisation process to convert a given basis of Euclidean space to an Orthonormal Base of the Euclidean space(PLO1, PLO2, PLO3, PLO4, PLO5)</td></tr>
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<tr><td></td><td colspan="2">CLO13: Use Mathlab for vector spaces (PLO1, PLO2, PLO3, PLO4, PLO5)</td></tr>
<tr><td>Content
(Main topics, sub topics)</td><td colspan="2">Vector Spaces
Fields, Vector spaces , Sub spaces, Spanning set and Basis of a vector space , Linear independence and dependence, Linear Transformations, Vector space Hom(V,W) and Isomorphism, Rank and nullity of a linear transformation, Invariant sub spaces and Inner product subspaces, Length of a vector in an invariant subspaces/ inner product subspaces, Distance between two vectors in an Invariant subspaces/ inner product subspaces, Concept angle between two vectors in an invariant subspaces/ inner product subspaces, Orthogonal set in the Euclidian space, Orthonormal Base in the Euclidian space, Gram – Schmidt Orthonormalisation process</td></tr>
<tr><td>Teaching Learning methods (TL)</td><td colspan="2">Self-Learning/Independent learning of Self-study
▪ Instructional Material (IL)
▪ Online Activities (OL)
▪ Reference Work (RF)

Compulsory contact sessions
▪ Assessments (AS) and Feedback – MCQs (MCQ);Structured Essay (SEQ); Essay Questions (ES);

Non-compulsory contact sessions
▪ Day Schools (DS)</td></tr>
<tr><td rowspan="2">Assessment strategy</td><td>Overall Continuous Assessment Mark (OCAM): 40%</td><td>Final Assessment (FA): 60%</td></tr>
<tr><td>Details: Continuous Assessment1 (CAT1): -1hr
Continuous Assessment2 (CAT2): -1hr
OCAM=60%Maximum(CAT1, CAT2) +
40%Minimum(CAT1, CAT2)</td><td>Final Evaluation -Theory: 100%-2hrs</td></tr>
<tr><td>Recommended Readings:</td><td colspan="2">• Mirsky, L. (1990). An Introduction to linear algebra (1990 Edition). Dover Publishers, New York.
• Bhushan, K. (2017). Matrix and linear algebra aided with MATLAB (3rd Edition). PHI Learning, Pvt.</td></tr>
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