A N N A M A L A I U N I V E R S I T Y

(Accredited with 'A+' Grade by NAAC)

CENTRE FOR DISTANCE AND ONLINE EDUCATION

Annamalainagar – 608 002.

Semester Pattern: 2024-25
Instructions to submit Second Semester Assignments

1. Following the introduction of semester pattern, it becomes **mandatory for candidates to submit assignment for each course.**
2. Assignment topics for each course will be displayed in the A.U, CDOE website (**www.audde.in**).
3. Each assignment contains 5 questions and the candidate should answer all the 5 questions. Candidates should submit assignments for each course separately. (5 Questions x 5 Marks =25 marks).
4. Answer for each assignment question should not exceed 4 pages. Use only A4 sheets and write on one side only. **Write your Enrollment number on the top right corner** of all the pages.
5. Add a template / content page and provide details regarding your Name, Enrollment number, Programme name, Code and Assignment topic. Assignments without template / content page will not be accepted.
6. Assignments should be handwritten only. Typed or printed or photocopied assignments will not be accepted.
7. **Send all Second semester assignments in one envelope**. Send your assignments by Registered Post to The Director, Centre for Distance and Online Education, Annamalai University, Annamalai Nagar – 608002.
8. Write in bold letters, "**ASSIGNMENTS – SECOND SEMESTER**" along with PROGRAMME NAME on the top of the envelope.
9. Assignments received after the **last date with late fee** will not be evaluated.

Date to Remember

Last date to submit Second semester assignments	:	**15.04.2025**
Last date with late fee of Rs.300 (three hundred only)	:	**30.04.2025**

Dr. T. SRINIVASAN
Director

CENTRE FOR DISTANCE AND ONLINE EDUCATION

S018 – M.Sc. MATHEMATICS

FIRST YEAR – II SEMESTER

ASSIGNMENT QUESTIONS

<u>018E1210: ADVANCED ALGEBRA</u>

1. Prove that the elements $a \in K$ is algebraic over F, if and only if $F(a)$ is a finite extension of F.
2. If V is a finite extension over f, then for $S, T \in A(V)$ prove that
   (a) $r(ST) \leq r(T)$ (b) $r(TS) \leq r(T)$
   (c) $r(ST) = r(TS) = r(T)$for$S$ regular in $A(V)$.
3. For each $i = 2, \cdots, kv_i \neq 0$ and $V = V_1 \oplus V_2 \oplus, \cdots, \oplus V_R$, the minimal polynomial of T_i is $q_i(x)^i$.
4. If N is normal and $AN = NA$ then prove that $AN^* = N^*A$.
5. State and prove Wedderburn's theorem on finite Division Rings.

<u>018E1220: MEASURE THEORY</u>

1. Show that the outer measure of an interval is it length.
2. State and prove monotone convergence theorem.
3. If f is a absolutely continuous on $[a, b]$ and $f'(x) = 0$ almost everywhere then prove that f is a constant.
4. Prove that $(1 + a) > e^a$ if $a > 0$; or $(1 - a) > e^{-a}$ if $0 < a < 1$.
5. State and prove Tannery's theorem.

<u>018E1230: DIFFERENTIAL GEOMETRY</u>

1. (a) Define arc length. Derive the formula for arc length of the space curve and prove that $[\bar{r}', \bar{r}'', \bar{r}'''] = k^2\tau$ with usual notations.
   (b) Obtain the curvature and torsion of the curve of interaction of the two surfaces $ax^2 + by^2 + cz^2 = 1$ and $a^1x^2 + b^1y^2 + c^1z^2 = 1$ and also find the curvature, torsion and osculating plane of the cubic curve $\bar{r} = (u, u^2, u^3)$.

2. (a) State and prove the fundamental Existence theorem for space curves.

   (b)State and prove Serret-Frenet formula and also prove that if the radius of curvature is constant then the curve either lies on a sphere or has constant curvature.

3. (a) State and prove Liourille's formula for Geodesic curvature of a curve (k_g) and also find E, F, G, H, if $\bar{r} = (u, v, u^2 - v^2)$.

   (b) Define Geodesic. Derive differential equating of a Geodesic and also show that for the anchor ring $\bar{r} = \{(b + a\cos u)\cos v, (b + a\cos u)\sin v, a\sin v\}$, the surface area is $4\pi^2 ab$.

4. (a) State and prove Gauss-Bonnet theorem.

   (b) State and prove Minding's theorem.

5. (a) Prove that a necessary sufficient condition for a surface to be developable is that its Gaussian curvature is zero and also find the equation to the developable which has the curve $x = 6t, y = 3t^2, z = 2t^3$, for its edge of regression.

   (b) State and prove Monge's Residue theorem and also show that the surface $e^z \cdot \cos x = \cos y$ is minimal.

018E1240: PARTIAL DIFFERENTIAL EQUATIONS AND TENSOR ANALYSIS

1. Find the integral surfaces of the Partial Differential Equation $(x - y)y^2 p + (y - x)x^2 q = (x^2 + y^2)z$ passing through the curve $xz = a^3, y = 0$.
2. Find the complete integral of $(p_1 + x_1)^2 + (p_2 + x_2)^2 + (p_3 + x_3)^2 = 3(x_1 + x_2 + x_3)$.
3. Solve $\frac{\partial^3 u}{\partial x^3} + \frac{\partial^3 u}{\partial y^3} + \frac{\partial^3 u}{\partial z^3} - 3\left(\frac{\partial^3}{\partial x \partial y \partial z}\right) = x^3 + y^3 + z^3 - 3xyz$.
4. Let $\{A(i_1, i_2, \cdots, i_r)\}$ be a set of function of the variable x^i and let the inner product $A(\alpha, i_2, \cdots, i_r)\xi_i^\alpha$ with an arbitrary vector ξ_j, be a tensor of the type $A_{k_1,k_2,\cdots,k_p}^{j_1,j_2,\cdots,j_q}(x)$, then the set $A(i_1, i_2, \cdots, i_r)$ represents the tensor of the type $A_{k_1,k_2,\cdots,k_p}^{j_1,j_2,\cdots,j_q}(x)$.
5. State and prove Jacobi's theorem.