SAMPLE WEEKLY RESEARCH SCHEDULE

NREUP 2026 AT UT MARTIN

A representative week from the NREUP 2026 site I directed at UT Martin. Each day mixes theory, coding, and writing, and builds toward Thursday, when students give cross-project presentations on their weekly progress to the department. Student names are anonymized; two students worked in parallel throughout the week.

Monday

9:00–9:30 Cartesian-to-polar coordinate conversion for a simple problem.
(i) $(x^2 + y^2 - x)^2 = x^2 + y^2$
(ii) $(x^2 + y^2)^2 = x^2 - y^2$

9:30–10:00 Cartesian-to-polar conversion for the actual research problem.

10:00–10:30 Type up the coordinate-conversion work (with Dr. Bandyopadhyay in the room).

10:30–11:30 Student 1: work through the backward direction of the main phase-function theorem and type it up. Student 2: re-derive the supporting arctan formula (with Dr. Bandyopadhyay in the room).

11:30–12:30 Lunch break.

12:30–1:00 Student 2: re-derive the arccot formula for the phase equation. Student 1: compute the relevant operator quantities.

1:00–2:00 Student 1: complete typing the proof of the main computational theorem. Student 2: complete rewriting the supporting lemmas.

2:00–2:30 Shooting-method coding in Google Colab: practice problem 1.

2:30–3:00 Shooting-method coding in Google Colab: practice problem 2.

3:00–3:30 Coffee break (flexible).

3:30–4:30 Research seminar.

Tuesday

9:00–9:30 Bound, monotonicity, and continuity of the phase function.

9:30–10:00 Expression and bound for $\cot\theta_{k+1}$ in terms of θ_k.

10:00–10:30 Type everything into the working document.

10:30–11:00 Student 2: read up on quasiderivative vs. derivative; prepare the corresponding slide and the monotonicity-theorem slide.

11:00–12:00 Find $\lim_{\lambda\to\infty} \cot\theta_{k+1}$.

12:00–12:30 Lunch break.

12:30–1:30 Find $\lim_{\lambda\to-\infty} \cot\theta_{k+1}$.

2:00–3:00 Type everything.

3:00–3:30 Coffee break.

3:30–4:00 Write the problem as an operator equation; look up properties of self-adjoint problems.

Wednesday

9:00–9:30 Write the governing equation in node form with x_k, x_{k+1}, x_{k+2}.

9:30–10:30 Build matrices B and D such that $M = B - \lambda D = 0$; find the dimensions of B and D.

10:30–11:30 Type everything.

11:30–12:00 Lunch break.

12:00–3:00 Python coding session with a collaborator (uniform grid with smaller eigenvalue).

3:00–3:30 Coffee break.
3:30–4:30 Research seminar.

Thursday

9:15–9:25 Recap the previous day's clean uniform result; write a one-line prediction for how recovery degrades as k grows and the grid skews.
9:25–9:40 Build `graded_grid(n, ratio)`; plot the step sizes h_i to see the $r \approx 1.04$ geometric growth.
9:40–9:55 Re-run RK4 shooting for $k = 1 \dots 6$ on the graded grid; confirm it still recovers $\lambda = k^2$.
9:55–10:15 Push to $k = 10, 15, 20$; tabulate recovered λ, true k^2, and relative error. Watch $k = 15, 20$ miss.
10:15–10:25 Break.
10:25–10:40 Build `clustered_grid(n, 0.60, 0.25)`; plot h_i to see the coarse outer region.
10:40–11:00 Run the same $k = 1, 5, 10, 15, 20$ sweep on the clustered grid; tabulate errors.
11:00–11:15 Compare the two grids side by side; discuss why skew, not location, drives the failure ($\sin(kx)$ oscillates uniformly).
11:15–11:35 Add the points-per-wavelength column $(2\pi/k)/h_{\max}$; find the value where each grid breaks.
11:35–11:55 Identify the $\approx$ 3–5 points-per-wavelength threshold across all runs; save the tables and plots for the write-up.
11:55–12:00 Quick recap with a collaborator: which cases worked, which broke, what the failure looked like.
12:00–1:00 Lunch break.
1:00–3:00 Presentation preparation (with Dr. Bandyopadhyay).
3:00–3:30 Coffee break.
3:30–4:30 Cross-project presentations on weekly progress by students to the department.

Friday

No scheduled research (Juneteenth). The group gathered in the evening for a game night and barbecue at a colleague's home.