Teaching Plan (DSC-3, and DSE-1(iii): Theory of Equations and Symmetries):
B.A. (Prog.) with Mathematics as Major, and B.Sc. (Physical Sc./Mathematical Sc.), Sem-3.

Weeks 1 and 2: General properties of polynomials and equations; Statement of the Fundamental theorem of algebra and its consequences.
[1] Chapter I (Sections 8, 9 and 10); Chapter II (Sections 12 to 17).
[2] Chapter II (Sections 13 to 19)

Weeks 3 and 4: Theorems on imaginary, integral and rational roots; Descartes' rule of signs for positive and negative roots.
[1] Chapter II (Sections 18 to 22).
[2] Chapter II (Sections 21, 24, 25 and 27), and Chapter VI [Section 67]
(Proofs of theorems in the Chapters II and VI are omitted).

Weeks 5 and 6: Relations between the roots and coefficients of equations, Applications to solution of equations when an additional relation among the roots is given.
[1] Chapter III (Sections 23 and 24).
[2] Chapter II (Sections 20).

Weeks 7 and 8: De Moivre's theorem for rational indices, the nth roots of unity and symmetries of the solutions; Transformation of equations (multiplication, reciprocal, increase/diminish in the roots by a given quantity), Removal of terms.
[2] Chapter I (Sections 7 to 10).
[1] Chapter III (Section 26); Chapter IV (Sections 29 to 34).

Weeks 9 and 10: Cardon's method of solving cubic and Descartes' method of solving biquadratic equations.
[1] Chapter VI (Sections 56 and 64).
[2] Chapter IV (Sections 42, 43, 51 and 52).

Weeks 11 and 12: Elementary symmetric functions and symmetric functions of the roots of an equation; Newton's theorem on sums of the like powers of the roots.
[2] Chapter IX (Sections 103 to 106, methods only).
[1] Chapter VIII (Section 77, method only).

Weeks 13 to 15: Computation of symmetric functions such as:

$\sum \alpha^2\beta,\ \sum \alpha^2\beta^2, \sum \alpha^2\beta\gamma, \sum \frac{1}{\alpha^2\beta\gamma}, \sum \alpha^{-3}, \sum (\beta+\gamma-\alpha)^2,\ \sum \frac{\alpha^2+\beta\gamma}{\beta+\gamma}, \ldots$ of polynomial equations;

Transformation of equations by symmetric functions and in general.
[1] Chapter III (Sections 27 and 28); Chapter IV (Sections 39, 41 and 44).
[2] Chapter IX (Section 109, methods only).

Essential Readings:

1. Burnside, W.S., & Panton, A.W. (1979). *The Theory of Equations* (11th ed.). Vol. 1. Dover Publications, Inc. (4th Indian reprint. S. Chand & Co. New Delhi).
2. Dickson, Leonard Eugene (2009). *First Course in the Theory of Equations*. John Wiley & Sons, Inc. The Project Gutenberg eBook: http://www.gutenberg.org/ebooks/29785