# NAG Fortran Library Routine Document

# F06YPF (DSYRK)

**Note:** before using this routine, please read the Users' Note for your implementation to check the interpretation of ***bold italicised*** terms and other implementation-dependent details.

## 1 Purpose

F06YPF (DSYRK) performs one of the symmetric rank-$k$ update operations

$$C \leftarrow \alpha AA^T + \beta C \quad \text{or} \quad C \leftarrow \alpha A^T A + \beta C$$

where $A$ is a real matrix, $C$ is an $n$ by $n$ real symmetric matrix, and $\alpha$ and $\beta$ are real scalars.

## 2 Specification

```
SUBROUTINE F06YPF (UPLO, TRANS, N, K, ALPHA, A, LDA, BETA, C, LDC)
INTEGER             N, K, LDA, LDC
double precision    ALPHA, A(LDA,*), BETA, C(LDC,*)
CHARACTER*1         UPLO, TRANS
```

The routine may be called by its BLAS name ***dsyrk***.

## 3 Description

None.

## 4 References

None.

## 5 Parameters

1: UPLO – CHARACTER*1 *Input*

*On entry*: specifies whether the upper or lower triangular part of $C$ is stored as follows:

if UPLO = 'U', the upper triangular part of $C$ is stored;
if UPLO = 'L', the lower triangular part of $C$ is stored.

*Constraint*: UPLO = 'U' or 'L'.

2: TRANS – CHARACTER*1 *Input*

*On entry*: specifies the operation to be performed as follows:

if TRANS = 'N', $C \leftarrow \alpha AA^T + \beta C$;
if TRANS = 'T' or 'C', $C \leftarrow \alpha A^T A + \beta C$.

*Constraint*: TRANS = 'N', 'T' or 'C'.

3: N – INTEGER *Input*

*On entry*: $n$, the order of the matrix $C$; the number of rows of $A$ if TRANS = 'N', or the number of columns of $A$ otherwise.

*Constraint*: N $\geq 0$.

4: K – INTEGER *Input*

*On entry*: $k$, the number of columns of $A$ if TRANS = 'N', or the number of rows of $A$ otherwise.

*Constraint*: $\mathrm{K} \geq 0$.

5: ALPHA – ***double precision*** *Input*

*On entry*: the scalar $\alpha$.

6: A(LDA,$*$) – ***double precision*** array *Input*

**Note**: the second dimension of the array A must be at least $\max(1, \mathrm{K})$ if TRANS = 'N' and at least $\max(1, \mathrm{N})$ otherwise.

*On entry*: the matrix $A$; $A$ is $n$ by $k$ if TRANS = 'N', or $k$ by $n$ otherwise.

7: LDA – INTEGER *Input*

*On entry*: the first dimension of the array A as declared in the (sub)program from which F06YPF (DSYRK) is called.

*Constraint*: $\mathrm{LDA} \geq \max(1, \mathrm{N})$ if TRANS = 'N'; $\mathrm{LDA} \geq \max(1, \mathrm{K})$ otherwise.

8: BETA – ***double precision*** *Input*

*On entry*: the scalar $\beta$.

9: C(LDC,$*$) – ***double precision*** array *Input/Output*

**Note**: the second dimension of the array C must be at least $\max(1, \mathrm{N})$.

*On entry*: the $n$ by $n$ symmetric matrix $C$. If UPLO = 'U', the upper triangle of $C$ must be stored and the elements of the array below the diagonal are not referenced; if UPLO = 'L', the lower triangle of $C$ must be stored and the elements of the array above the diagonal are not referenced.

*On exit*: the updated matrix $C$.

10: LDC – INTEGER *Input*

*On entry*: the first dimension of the array C as declared in the (sub)program from which F06YPF (DSYRK) is called.

*Constraint*: $\mathrm{LDC} \geq \max(1, \mathrm{N})$.

## 6 Error Indicators and Warnings

None.